ARCHIVES OF OPHTHALMOLOGY.

THE PATHOLOGY OF THE AMBLYOPIA FOLLOWING PROFUSE HEMORRHAGE AND OF THAT FOLLOWING THE INGESTION OF METHYL ALCOHOL, WITH REMARKS ON THE PATHOGENESIS OF OPTIC-NERVE ATROPHY IN GENERAL.[1]

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(*With two figures on Text-Plate VIII.*)

I.—Amblyopia after Profuse Hemorrhage.

CASES of blindness after hemorrhage are reported from time to time, and, in its clinical aspects, this condition is well understood and may briefly be described as follows: Occasionally, after profuse or repeated hemorrhage from the gastro-intestinal tract or the uterus, and very rarely after surgical hemorrhage, there is noticed immediately, or, more frequently, after the lapse of days, a sudden diminution of vision in both eyes, which often goes on to complete and permanent blindness with the ophthalmoscopic picture of atrophy of the optic nerves.

In explanation of this condition many theories as to its pathogenesis have been offered, most of which assume pressure on the optic nerves or tracts from hemorrhage or exudation, and Graefe's theory specifically assumed hemorrhage into the sheaths of the nerve. Microscopic examinations of such eyes have not been wanting, and various pathological conditions of the retina have been described, but, as most of these examinations were made by older methods

[1] Read before the Ophthalmological Section of the New York Academy of Medicine, February, 1899. From the Pathological Institute of the New York State Hospitals.

and at a time when the significance of certain retinal changes was less understood than to-day, these reports led to no very definite conclusions, and it may safely be said that up to the present time no explanation of this condition has been generally accepted.

Since experiments on quinine amblyopia in animals [1] gave me a suggestion as to the cause of the amblyopia following hemorrhage, it seemed worth while to undertake some animal experiments in this regard; and, although it did not appear likely that complete blindness could be brought about by bleeding healthy animals, it nevertheless seemed probable at least that changes might be produced in the visual apparatus sufficient to indicate clearly the nature of the process that sometimes does lead to blindness.

And, in fact, experiments done at the Pathological Institute of the New York State Hospitals on half a dozen dogs and rabbits led to positive results, the pathological findings being, in short, as follows: One or two days after a single profuse hemorrhage, signs of œdema of the nerve-fibre and ganglion-cell layers of the retina were present, and some of the ganglion cells showed evidences of beginning degeneration. Two weeks after a profuse hemorrhage, or after repeated moderate hemorrhages, simple œdema of the nerve-fibre layer still existing, there were advanced degenerative changes in many of the ganglion cells and in the medullary sheaths of their axis-cylinders throughout the optic nerves, chiasm, and tracts.

The changes were so uniform in all, that only two cases need be related in detail:

Case 1.—A healthy dog with normal eyes, weighing 4.5 K, was bled 120 *cc* from the external jugular vein, in chloroform narcosis, and was killed with chloroform, twenty-four hours later, vision apparently not having been affected, and the ophthalmoscopic picture remaining normal.

The retinas after being fixed in 5 per cent. formol, hardened in alcohol, and cut in paraffin, were stained by Nissl's methylene-blue method and the following changes were found: The fibres in

[1] These Archives, xxvii., 6, 583.

the nerve-fibre layer were slightly spaced apart, a number of Müller's fibres were ruptured, and the membrana limitans interna was detached here and there—changes indicating the presence of a non-coagulable liquid in the nerve-fibre layer, or, in other words, a simple serous œdema. Some of the ganglion cells had notched margins, and their chromatic granules were wanting in the periphery of the cell, indicating a beginning primary parenchymatous degeneration. The bipolar cells of the inner nuclear layer, instead of exhibiting a number of granules scattered through the nucleus, contained very few granules, and these were arranged mostly just at the margin of the nucleus, indicating disturbed nutrition of the cell. Further than this the retinas were normal.

Case 2.—A healthy dog with normal eyes, weighing 8 K, was bled 250 *cc* from the external jugular vein under chloroform. After the effects of the chloroform had passed off, the dog staggered and was weak in its hind legs. Fifteen days later the dog was still quite weak and had become emaciated. Vision seemed to be good. No ophthalmoscopic changes were noticed in the retinas, but the optic discs appeared somewhat pale. The dog was killed with chloroform. No hemorrhages or other gross changes were found in the orbital or cranial cavities, nor, in fact, were gross changes found in any of the animals examined.

The retinas, stained by Nissl's method, exhibited signs of œdema of the nerve-fibre and ganglion-cell layers, and a lack of granules in the nuclei of the inner nuclear layer exactly as in Case 1. The ganglion cells, however, were in a more advanced stage of degeneration and more cells were affected than in Case 1 (Fig. 1, Text-Plate VIII.). The margins of the cells were notched and irregular, the chromatic substance was wanting in places, and frequently the cell body was partly broken down, and the nuclei in many cells had migrated to the periphery.

The optic nerves, chiasm, and tracts, stained by Marchi's osmic-acid method, now exhibited many black deposits, indicating a breaking down of the medullary sheaths of the fibres into fatty globules.

The pathological condition, then, was a degeneration of a number of retinal ganglion cells together with their long processes which make up the centripetal fibres of the optic nerve.

In order to learn whether changes had occurred in other

portions of the visual tract, the external geniculate bodies, the anterior quadrigeminal bodies, and the cortical visual area in the occipital lobe were examined for ganglion-cell changes, and the optic radiations were examined for nerve-fibre changes. No marked changes were found in the ganglion cells of these parts and none at all in the fibres of the optic radiations, which shows that in acute general anæmia the retinal neurons suffer more than the basal and cortical neurons of the visual tract.

Chronic anæmia, also, is not without its effect on the retinal ganglion cells. In cases of pernicious anæmia there have frequently been described hemorrhages and œdema of the retina and swelling of the axis-cylinders near the seat of the hemorrhages. Further than this, in two cases of pernicious anæmia with œdema of the retina and hemorrhages, but with no very marked changes in the axis-cylinders, I found the nucleus crowded to the margin of the cell in nearly every ganglion cell in the retinas. This migration of the nucleus is an early sign of some forms of ganglion-cell degeneration, and, while it is likely to be found in the ganglion cells of the central nervous system in wasting diseases, in a case of phthisis I found it existing in fewer retinal cells than in the cases of pernicious anæmia.

For the ordinary cases of amblyopia following hemorrhage, we have thus found a sufficient explanation in the degeneration of the retinal ganglion cells from diminished nutrition.

In these ordinary cases the vision fails in the entire field, while at first ophthalmoscopic changes either are wanting, or, if present, consist only in a slight œdema of the retina with or without hemorrhages, and in narrowing of the retinal arteries with consequent pallor of the optic disc.

For certain other cases this explanation is not sufficient. Such cases, for example, are the rare ones in which the visual disturbance takes the form of central scotoma and the ophthalmoscopic changes indicate retrobulbar neuritis; such, also, is the unique case recently reported by Amos,[1]

[1] *Amer. Jour. of Ophth.*, May, 1898.

in which a uterine hemorrhage was followed by right homonymous hemianopsia, and a second uterine hemorrhage some time later led to left homonymous hemianopsia, with the preservation, finally, of only a minute central field.

Such exceptional cases require particular explanations, which can be given only after pathological investigation of the individual cases has been made.

II.—Amblyopia after Drinking Methyl Alcohol.

A suddenly developing amblyopia, in its clinical features resembling quinine amblyopia and the amblyopia following severe hemorrhage, is that which has been observed a number of times after the ingestion of methyl alcohol. A case of permanent blindness from swallowing 60 *cc* of methyl alcohol was reported a short time ago by McCoy and Michael,[1] and Dr. Callan recently related to the New York Ophthalmological Society the history of two men who drank an undetermined quantity of methyl alcohol, one dying of the effects and the other becoming totally blind. The similarity in clinical course suggested a similarity in pathology, and methyl-alcohol experiments were tried with several dogs. The animals, however, did not prove to be so susceptible to the toxic effects as might have been expected from what we know of the effects of methyl alcohol on man.

Thus, 25 *cc* of methyl alcohol given *per os* to a dog of 9 K weight, produced a dilatation of the pupils and a continued staggering gait, but, when the dog was killed on the third day, only very slight changes were found in the retina.

A successful experiment was the following:

Jan. 11, 1899.—A healthy dog, weighing 10 K, was chloroformed, and 50 *cc* of methyl alcohol, diluted with an equal volume of water, was introduced into the stomach through a tube. After recovery from the chloroform the pupils were quite small and the dog soon became violently intoxicated, throwing itself about in a frenzy.

Jan. 13th.—Pupils slightly dilated, general weakness, staggering gait.

[1] *N. Y. Med. Record*, May 28, 1898.

Jan. 16th.—Dog apparently well. Fundi normal. 50 *cc* of methyl alcohol, diluted, was given by the stomach tube without narcosis. Fifteen minutes later the pupils were very large, and the dog staggered about and bumped into objects as if it were completely blind. The hearing was not entirely abolished.

Jan. 18th.—Pupils of normal size, some general weakness, sight apparently fairly good, but the dog continually rubs its eyes with its paws.

Jan. 26th.—For the past three days the dog has eaten very little and is now greatly emaciated. The corneas have become diffusely hazy, except in the periphery, but the eyeballs present no signs of congestion.

Jan. 27th.—Early in the morning the dog was found dead, but still warm. The autopsy was made at once. Great congestion and numerous hemorrhages were found in the meninges of the cord and brain.

The retinas were stained by Nissl's method. There were post-mortem changes in the rods and cones. The bipolar cells of the inner nuclear layer appeared normal. The nerve-fibre and ganglion-cell layers were slightly œdematous, but no hemorrhages were found. Many of the ganglion cells were in a state of degeneration. In the optic nerves, stained by Marchi's method, the medullary sheaths of some of the fibres were broken down.

The amblyopia due to the use of methyl alcohol, therefore, comes into the category of those amblyopias which are due to nutritive disturbances in the ganglion cells of the retina.

III.—General Remarks.

These amblyopias are so rare that they are comparatively of little clinical importance, but their pathology, as now revealed, is extremely suggestive as regards other amblyopias that are more common, and, therefore, of greater clinical importance, and I should like to say a few words, in a preliminary way, on the physiology of the neurons of the visual tract and on our present conceptions as to their pathology.

The ganglion cell, with its short processes and its long axis-cylinder process which is generally medullated and ends in a terminal arborization, is now comprehensively termed "the neuron," since it is the fundamental nerve element or histological unit.

To-day, thanks to the labors of Gudden, Monakow, Henschen, Ganser, Bechterew, Bernheimer, Ramon y Cajal, and many others, we understand fairly well the arrangement of the neurons in the visual tract, and may most simply represent them schematically in the manner shown in Fig. 2, Text-Plate VIII.

Between the retina and the basal primary optic centres—the external geniculate body, the anterior quadrigeminal body, and the pulvinar—neurons extend both centripetally and centrifugally; and, also, between the cortical visual area and the basal primary optic centres neurons extend both centripetally and centrifugally.

The nutrition of the neuron is governed by the ganglion cell. If the axis-cylinder is cut or compressed, its distal portion which is separated from the ganglion cell atrophies quickly, but the proximal portion remains intact. The neuron, however, cannot now perform its function, and, after months or years, the remaining portion of the axis-cylinder breaks down and the cell then usually degenerates and disappears.

Similarly, a *primary* atrophy of the centripetal neurons of the optic nerve from disease of the retinal ganglion cells or from section of the optic nerve, is followed later by a *secondary* atrophy of the non-functionating centrifugal neurons whose ganglion cells lie in the primary basal optic centres. Removal of the cuneus of the occipital lobe is followed, first, by a primary atrophy of the fibres running to the basal optic centres, and, later, by a secondary atrophy of those cells lying in the primary basal optic centres, whose axis-cylinders run to the cuneus. In young animals these secondary degenerations, as Gudden long ago showed, come on very soon. In adult animals they are longer delayed, and months and even years must elapse before the process is complete. Thus, in adults, after section of the optic nerve or after disease of the primary optic centres, descending atrophy of the centrifugal fibres in the optic nerve and retina takes place, but the retinal ganglion cells may remain for years. For example, in a case of pressure on the optic tracts from an enlarged pituitary body in akromegaly, with

white discs and great contraction of the visual fields, the process having lasted for years, I found the ganglion cells still preserved even in the extreme periphery of the retina.

The important point which I now wish to make is that, in the absence of inflammation in the interstitial connective tissue of a tract of nerve fibres, and in the absence of direct pressure on them, a primary atrophy of these fibres, according to our present conception of the neuron, is due to disease of the ganglion cells from which the fibres arise.

Therefore, in the simple atrophy of the optic nerve that comes on in nervous diseases like tabes, for example, we should expect to find either disease of the ganglion cells in the basal optic centres, or of the ganglion cells in the retina.

Disease of the basal optic centres of one side, however, causes homonymous hemianopic defects in the visual fields of the two eyes, but homonymous hemianopic defects are very rare in tabes. Disease of the basal optic centres, furthermore, while it causes atrophy of certain fibres in the optic nerve and retina, does not cause degeneration of the ganglion cells in the retina until later. In complete tabic atrophy of the optic nerve, on the contrary, the retinal ganglion cells have been found by various observers to have disappeared. And the complete proof of the retinal origin of tabic optic-nerve atrophy seems to me to be furnished by a case I am now examining, that of a tabic patient who was blind for four years before his death. In the retina there can be found only isolated degenerated ganglion cells here and there, even in sections through the macula, about which the ganglion-cell layer normally is thickest.

The second cellular stratum in the superficial portion of the anterior quadrigeminal body, composed of elongated ganglion cells, is now generally conceded to be that from which arise the bulk of the axis-cylinders which run from the basal optic centres to the retinas. In this case of tabic atrophy of the optic nerve, the cells of this stratum, as compared with those in sections from a healthy brain, appear to be normal, both in number and appearance. These conditions thus clearly indicate primary degenera-

tion of the retinal neurons, unaccompanied as yet by secondary degeneration of the basal neurons.

The conception of tabic atrophy of the optic nerve as being due to disease of the retinal ganglion cells may seem radical to ophthalmologists, for they have commonly regarded tabic optic-nerve atrophy as being an affection purely of the optic nerve itself, related in some mysterious way to a disease of the spinal cord; but neurologists, now conceiving tabes to be a primary degeneration of various distinct groups of neurons in the body, are already hinting at a degeneration of the peripheral neurons in the optic-nerve atrophy of tabes. Besides finding that the atrophy of the optic nerve in some varieties of acute amblyopia is due to an affection of the retinal ganglion cells, I found that the optic-nerve atrophy in amaurotic family idiocy or Tay's disease of the macula lutea is due to a primary disease of the ganglion cells of the retina.[1] And, while the causation of optic neuritis is still entirely obscure, and the process in retrobulbar neuritis, of toxic or other origin, is as yet not definitely understood, the ordinary so-called simple atrophies of the optic nerve are likely soon to be generally conceded to consist in a primary degeneration of the ganglion cells of the retina and their axis-cylinders running to the basal optic centres.

Explanation of the Figures.

FIG. 1, Text-Plate VIII.—Œdema of the nerve-fibre and ganglion-cell layers, and advanced degeneration of the ganglion cells in a dog's retina fifteen days after bleeding 31 *cc* to the kilo of body weight. Nissl stain. Zeiss $\frac{1}{12}$ immer. Comp. oc. 8. Reduced $\frac{1}{2}$.

FIG. 2.—Diagram of the neurons of the visual tract.

From the temporal halves of the retinas afferent neurons run to the basal centres of the same sides, and from the nasal halves to the centres of the other sides. From the right basal centres efferent neurons run to the right halves of the retinas, and from the left basal centres to the left halves of the retinas.

[1] *Journal of Nervous and Mental Disease*, July, 1898.

In the second system, neurons run from the basal centres of one side to the neighborhood of the calcarine fissure of the same side, and corresponding neurons from the gray matter about the calcarine fissure run back to the basal centres of the same side.

THE INTRODUCTION OF IODOFORM INTO THE ANTERIOR CHAMBER OF THE EYE IN TUBERCULAR IRITIS.[1]

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THE decided amelioration, if only of limited duration, observed in a case of irido-ciliary tuberculosis, treated with subconjunctival and intraocular injections of sterilized iodoform, led to the idea of conducting a series of similar experiments on animals. Inasmuch as this very case has already been published by *Ammann* in the *Klinische Monatsblätter für Augenheilkunde*, May, 1897, a comparison between his results, which were made upon the human subject, and those obtained from experiments on animals may be of interest.

Ammann's description briefly reviewed: Irido-ciliary tuberculosis of one eye, accompanied by swelling of the preauricular gland on the same and the submaxillary on both sides. At first treated with subconjunctival injections of an iodoform-vaseline salve 1 : 5, and the tubercular process advanced. Later sterilized iodoform powder was introduced into the anterior chamber, and a decrease in the size of the tubercles of the iris followed. Although another introduction of iodoform was made, an advancement in the process was noted, and the enucleation carried out. Microscopically the tumor was found to consist mainly of a mass of granulation tissue, formed principally of closely aggregated tubercles, separated from one another by sparingly interwoven connective tissue. A most thorough search for the tubercle bacillus terminated negatively.

[1] From the University Eye-Clinic in Zürich.

The results of iodoform and its various combinations in localized tuberculosis taught us not to expect a cure in advanced cases. Therefore we did not conduct our experiments with the expectation of a cure in similar cases in rabbits—a class of animals peculiarly susceptible to this disease,—but our researches took rather the form of an investigation of its ameliorating power, hoping thus to test its fitness for tubercular iritis in the human subject. That investigations of this kind may yield practically useful results, appears demonstrated by inoculation experiments of H. Knapp,[1] who reported an interesting and unique observation on this question which it is well to bear in mind. He describes the *spontaneous* cure of an artificial binocular tubercular iritis in a rabbit, which took place, not as tubercular affections generally do in the human being, by the process of calcification or shrinkage after ulceration, but by simple absorption, just as a gumma of the iris disappears.

For the subject of this article I am indebted to my chief, Prof. O. Haab. For this as well as for his able advice and aid at other times, I take this opportunity to most heartily thank him.

Owing to the condition of the instruments used and the extreme wildness of the rabbits, the wounds could not be as clean cut as in the human subject; therefore in considering the results an allowance must be made for undue consequent reaction.

In March, 1897, we implanted in the anterior chamber of two rabbits, material which had been taken from a human iris and ciliary body, diagnosed as tubercular. This assumption was, later, not only verified by a typical picture of tubercular iritis in all four eyes of the rabbits, but also by finding the tubercle bacillus in the anterior uveal tract of the enucleated bulbus. A brief description of this is published by the author, in the *Archiv für Augenheilkunde*, vol. xxxvi., p. 96.

One of the foregoing rabbits, which for the sake of convenience we will term No. I., was chosen as a fit subject for experiments, inasmuch as after the lapse of but four weeks from the exposure

[1] "Beitrag zur Tuberkulosenfrage." Festschrift zur Feier des siebzigsten Geburtstages von Hermann von Helmholtz, Stuttgart, 1891.

of the iris to the tuberculous material located in the anterior chamber, tiny tubercles of a yellowish-gray tint, occupying an asymmetrical position in the lower half of the iris, are readily recognizable under an ordinary magnifying-glass.

Method of sterilizing the iodoform: Place the iodoform in a 3 % solution of carbolic acid for forty-eight hours. Pour the acid off. Plug the receptacle with sterilized cotton, put it in an oven with a constant temperature of 40° C. to dry and free it from the remnants of carbolic acid.

The operative technic also demands attention, inasmuch as it may be the first attempt to introduce a remedy in powdered form into the anterior chamber: 1. Cleanse and cocainize the conjunctival sac. 2. Apply the ecarteure and fixing forceps. 3. Puncture the cornea with the lance. This wound should be just sufficiently large to comfortably admit an ordinary canula. 4. The latter instrument, previously partially loaded with sterilized iodoform, is introduced into the anterior chamber and its contents deposited by means of a blunt trocar. The trocar is blunt, to avoid injury to the lens capsule, and to discharge the contents of the canula more advantageously. This same technic may serve to introduce other substances into the anterior chamber, etc., in other diseases.

RABBIT NO. I.

IV. 3. 97. The attempt is made to introduce sterilized iodoform into both eyes, but in the right we only partially succeeded on account of the extreme wildness of our subject.

IV. 6. It is a noteworthy fact that the left eye, which contains the more iodoform, shows the less external inflammation.

IV. 10. A fair-sized hyphæma is present in both eyes, probably of artificial origin.

V. 4. O. D. The ciliary reddening is still marked. Our small injection is yet present in at least half of its original quantity and has not perceptibly influenced the growth of the tubercles, which have become four times their former dimensions. The iris about these growths is thickened and some of its blood-vessels are fairly dilated.

O. S. The pericorneal congestion is but minimal. The hyphæma is totally absorbed. The mass of iodoform which was in-

troduced into this anterior chamber has been almost completely taken up. The minute superficial tubercles of the iris noticed at the time of the injection of the iodoform have left no definite trace. The remaining portions of the iris are free from any manifestation of inflammation or hyperæmia.

In one eye the introduction of a small quantity of iodoform powder into the anterior chamber was followed by abundant accidental hemorrhage and a positive advance in the tuberculosis; in the other eye the introduction of a larger quantity was followed by a slighter accidental hemorrhage and distinct alleviation of the symptoms. The logical conclusion is that the favorable issue in the latter case is due to the iodoform.

v. 22. About eleven weeks since the primary inoculation and seven weeks since the injection of iodoform took place; in O. D. the ciliary congestion, the well filled corneal blood-vessels, and opacity are still conspicuous. The slight amount of iodoform has disappeared. The tubercles situated in the lower central portion of the iris have markedly grown and are surrounded by numerous minute elevations. A second operation is determined upon. After great difficulty a minimal amount of iodoform reached the desired location.

O. S. This eye received the more tuberculous material as well as the more iodoform. The iris, as examined with the magnifying-glass, is perfectly free from tubercles. The iodoform mass has undergone a slight reduction in quantity.

vi. 10. O. S. It is now about five weeks since the disappearance of the tubercles. The iodoform has been completely absorbed. After this interval of apparent freedom from any tubercular infiltration, three minute grayish-yellow elevations, tubercles, are noticed with the magnifying-glass. They are situated in the central portion of the upper half of the iris, diametrically opposite the seat of the former nodules. The iris in this region just involved is slightly swollen and two small blood-vessels are prominent.

vi. 18. O. D. Operation No. 3. Even after the lance had finally forced an ample entrance into the narrow anterior chamber the attempt to introduce an adequate amount of iodoform into this lessened space is fruitless. Unluckily there is some iodoform forced into the cornea propria which forms the incision lips.

O. S. Operation No. 2. A decidedly smaller modicum of iodoform is injected than at the preceding sitting.

VI. 24. O. D. Between the lips themselves and in the corneal substance composing the same considerable iodoform remains. It was decided more advisable to allow this scattered iodoform to remain undisturbed, even if its inhibition demand some time, rather than attempt to advance it into the anterior chamber.

VII. 2. O. D. As the nodules have grown and the general swelling of the iris persisted, a dispersion of the iodoform in the wound itself and in its surroundings seemed urgently demanded. Accordingly this was undertaken and accomplished after much difficulty. The corneal wound was simply partially bridged by epithelium and a few scanty adhesions in the cornea propria.

O. S. The external injection has become comparatively faint. The magnifying-glass reveals the three minute protuberances to have become more grayish in color, contracted, and so indefinitely outlined that they are scarcely recognizable. The dilated blood-vessels of the iris in this immediate region have undergone a like retrograde fate. The iodoform has diminished in quantity —not less than one third of its volume has been taken up.

VII. 7. O. D. The iodoform has remained quite unchanged in amount. A thin membrane covers its anterior surface. The process advances.

O. S. Instead of viewing the iris almost free from papules, as might be expected from the rate of improvement, an advancement is perceived in the tubercular infiltration which has taken on the form of a cone with very minute papules occupying its entire apex. This cone is situated in the exact position of the three former protuberances, described for the first time VI. 18. Just here a distinct hyperæmic condition is conspicuous. Massage of the bulbus was employed to scatter the iodoform. (The massage was effected by friction under considerable pressure between the closed lid and the cornea.)

VII. 13. O. S. The rapidity with which the conus has diminished is most surprising, as to-day it is not more than one fourth its former size, and shows a total disappearance of those plainly outlined knobs which so recently occupied its apex. In this same region of the iris a small anterior hunchbacked protuberance is perceived—probably also of tubercular nature. It is peculiar that the process should here show a recession and there an advancement, all within a space with a diameter of about $\frac{3}{4}$ *cm.* That the massage employed at the last inspection had any direct beneficial action upon the tubercular process can only be very

guardedly claimed, but it is more plausible that it was it that altered the relation and condition of the particles composing the mass of iodoform.

VII. 19. O. S. *Singularly the conus has entirely disappeared, and its seat is only indicated by a small, shallow, grayish-brown excavation of irregularly circular form.* The hunchbacked elevation is scarcely more conspicuous than at the last examination, but now, not far from it, are two grayish-yellow nodules situated side by side, and together hardly the size of an ordinary pin-head. The iodoform shows neither alteration in position nor in amount.

VII. 31. O. D. The pathological condition has slowly progressed.

O. S. There is no pericorneal congestion. The iodoform has entirely disappeared. The coalescence of the two flattened tubercles is detected now with ease. These knobs have not grown particularly anteriorly, but have caused infiltration of the surrounding iris, which from its own thickness makes the corresponding portion of the already much altered anterior chamber appear unduly shallow. The blood-vessels of this pathological portion are overfilled and converge to a point where an anterior synechia is located. A white, and as it appears, fairly thick-fringed membrane slightly projects into the pupillary space, having its attachment in nearly its entire circumference on the posterior surface of the pupillary margin of the iris. On this same day the rabbit was killed by chloroform, and its eyes enucleated. The histological examination of the bulbi is given after the clinical description of rabbit II.

Inasmuch as our first experiment (rabbit No. I.) was obscured, whether favorably or unfavorably, by the intercurrent hyphæma, we now took a second animal.

RABBIT NO. II.

V. 22. 97. Both eyes are treated with material obtained from the more tubercular bulbus (O. S.) of the mate of rabbit I. To this material in the case of the right eye we injected enough iodoform to about half fill the anterior chamber. The left eye was allowed to develop untreated with iodoform.

The difference is striking between the appearance of the *left* eye of rabbit I., until now (V. 22. 97.) successfully treated with iodoform, and which is apparently free from tubercular infiltration, and the *left* eye of its mate, which never was subjected to the

action of iodoform, and in which a like material inoculated at the same sitting has made such rapid headway that a perforation is imminent at the sclero-corneal junction, in the position of the incision made for transporting the tuberculous substance into the anterior chamber.

VI. 3. O. D. The upper two thirds of the cornea presents a peculiar bluish-white opacity in the form of minute dots of irregular conformation and of narrow streaks, most of which cross the cornea in the horizontal direction. They are probably situated on its posterior surface. They are totally unlike the ordinary precipitates seen for example in so-called iritis serosa. The iodoform has seemingly lessened in bulk.

VI. 15. O. D. To simplify the description of the cornea, it can be divided into three zones,—the lower one lightly covered with blood-vessels, which are arranged much like "Nettleship's blood-vessels in interstitial keratitis"; the middle area presents the light-bluish opacity already spoken of in the centre only, just in front of the pupil, whereas the periphery is almost transparent, as is the entire upper third. The iodoform mass is unchanged.

O. S. The cornea as a whole appears enlarged and in its entire expanse presents the same bluish tone which is perceived in front of the pupil in the right cornea.

VII. 2. O. D. The light blue opacity in front of the pupil has disappeared. The iodoform is nearly absorbed. The tubercular mass has altered its contour; its former position in the lower anterior chamber is retained. The outer half of the pupil is partially hidden by a whitish arborescent membrane attached to the pupillary border of the *anterior* surface of the iris and to the anterior lens-capsule. The beginning of a similar membrane is seen on the nasal half.

O. S. The inspection of the iris reveals a number of small tubercles and dilated blood-vessels. The tubercular inoculation has disappeared.

VII. 7. O. D. The iodoform is completely taken up. The tuberculous inoculative substance has also vanished. The magnifying-glass easily discovers three yellowish-gray tubercles in the inferior portion of the iris. A second operative interference is immediately decided upon for the purpose of bringing iodoform in contact with these papules. The anterior chamber was nearly filled with iodoform.

O. S. There is a raging inflammation. The periphery of the

cornea shows a pannus of about $\frac{1}{4}$ *cm* in width, which toward the scar attains fully $\frac{3}{4}$ *cm*; the more central portion is unequally bluish. There is a slight anteriorly cone-like bulging of the incision scar.

VII. 19. O. D. The cornea shows a faint bluish opacity again. The iodoform has considerably diminished. There is a broad anterior synechia extending from the scar of the last incision as far as the sclero-corneal junction.

O. S. The conus in the region of the wound is less conspicuous, as the entire cornea has enlarged.

VII. 31. O. D. Minimal amount of iodoform present. Partial pupillary membrane smaller. Lens reflects as the human lens does when marked sclerosis of its nucleus is present. The three nodules have assumed a more *grayish* color. A fourth minute, yellowish-gray papule has been added to them. The iris here is somewhat swollen and blood-vessels are prominent.

O. S. The entire cornea with the exception of its very centre is covered by the progressive pannus. The cornea is anteriorly ovoid.

The rabbit is killed and the right eye only enucleated.

The O. D. and O. S. of rabbit I. and the O. D. of rabbit II. are now taken for microscopical examination. A small equatorial cut was made in each bulbus in order that the hardening and fixing fluids might better act upon the contents of the capsule. Alcohol is employed as the hardening agent, first 70%, next 96%, and last the alcohol absolutum. They remained here over two months. The bulbi were then halved. The anterior halves again vertically divided, placed in celloidin, and cut in 70% alcohol. The stains utilized were: alum-carmine, eosin and hæmatoxylin, van Gieson's, Weigert's fibrin-stain, and the carbol-fuchsin (*i. e.*, the solution of Ziehl). The method of staining the tubercle bacillus described in a former article by the author was closely followed. The picric-acid-fuchsin solution used in the van Gieson procedure was diluted to a *light* red in order that the sections might remain $\frac{1}{2}$–1 hour therein. The nuclei retained the *bluish* color entrusted to them by the hæmatoxylin, and the surrounding tissues took much the same nuances as from the stronger solutions.

MICROSCOPICAL EXAMINATION.

RABBIT I. O. D. The histological examination of the cornea corresponds quite exactly with the delineated clinical

course: dense infiltration of the scars and surrounding tissue with round cells, etc., synechiæ. The anterior chamber shows many aggregations of round cells, and presents also red blood corpuscles enclosed in networks of fibrin. The sclera is quite normal except for slight infiltration with round cells. The anterior surface of the iris presents a loose fibrinous layer, scantily infiltrated with round cells in those situations where it is not attached to the posterior corneal level. Some few preparations exhibit an almost normal iris, except for anterior synechia, the layer of fibrin, or a slight infiltration of round cells, but in *most* of the sections it is thickened, especially the pupillary portion, and is typically tubercular. Many epitheloid and giant cells enclose both fine and coarser pigment granules. Tubercle bacilli were only found in giant cells and by no means as plentifully as is usual in the artificially inoculated rabbit-iris. Posterior to the iris a broadly extending exudation is perceived, composed solely of lymph cells. Nearly the entire ciliary body is markedly thickened, resulting from dilatation of its blood-vessels and consequent outwandering of lymph cells. Epitheloid cells are observed in that portion adjoining the tubercular iris. Giant cells and tubercle bacilli fail. There is accordingly no correspondence between this picture and that described by *Ammann.*

O. S. Cornea, sclera, and anterior chamber much the same as in the right eye. The iris is, as a whole, thickened, resulting from vascular dilatation, from immigration of lymph cells and from distinctly tubercular masses containing numerous epitheloid and few giant cells. The search for the tubercle bacillus in these preparations was unsuccessful. Here, as in the right eye, a broad layer of lymph cells was found on the posterior surface of the iris. The ciliary body is quite normal in some sections, whereas in others, where it adjoins tubercular iris, it is highly hyperæmic and infiltrated with round cells.

RABBIT II. O. D. As in the other bulbi small isolated aggregations of round cells and fibrin are found on the membrane of Descemet, so also remains of anterior synechiæ in the form of a narrow mass of iris-tissue, which is bound

to the posterior surface of the cornea merely by a layer of round and connective-tissue cells. Small and broader anterior adhesions are observed. Corresponding to the pupillary exudate clinically noticed, a mass of vascular connective tissue infiltrated with lymph cells and attached to the pupillary ends of the iris sends out projections posterior to the iris. Most of them are free with torn borders, the result of the rupture from their attachments probably to the anterior lens-capsule (of which nothing is seen in the sections). This rupture is caused by the removal of the densified lens. Near the centre of the lower half of the anterior chamber is a small mass of granulation tissue with epitheloid cells, which is attached anteriorly to the cornea and posteriorly to the iris. This is an outgrowth from the iris, whose most superficial layers are also involved. Only a scanty number of epitheloid cells are present. It is fair to presume that but for the unfavorable condition produced by the iodoform these latter cells would have built giant cells. The result of the search for the tubercle bacillus was negative. A few small collections of round or epitheloid cells alone, or a combination of the two, are found in the iris. In most of the preparations the iris is normal, save for the dilatation of its blood-vessels and exudation from the same. The ciliary body is absolutely normal, with the exception of dilatation of its vessels and a very sparing transudation of lymph cells.

If in the acute tubercular iritis only the visibly diseased portions and their immediate surroundings are excised (iridectomy), it is probable, according to Leber "Über abgeSchwächte Tuberculose des Auges," *Bericht über die xxi. Vers. der ophthalm. Gesellschaft zu Heidelberg*, 1891, p. 44), that some affected iris yet remains, which is now capable of aggravated advancement, and further, as the process is acute, that this newly developing tissue contains more virulent and perhaps more abundant bacilli than in the chronic forms, making it very probable that bacilli will be scattered in the region of the wound in the course of the excision of diseased iris, which truly would be deleterious.

The opening through which, in our experiments, the iodoform was introduced into the anterior chamber lay wholly

within the cornea, so that all immediate contact with the bacilli was avoided, thus making our operation applicable to the acute as well as to the chronic form. Iodoform is free from the danger of arousing a latent tuberculosis in other organs, as occasionally resulted from Koch's lymph even in selected cases.

Before summing up, it is important to bring once more to mind the well acknowledged fact that rabbits possess a most extraordinary predisposition to tubercular affections. Is it then improbable that the results would be still more beneficial in the human subject? From the clinical details and the results of our histological examination the following conclusions are drawn:

1. Sterilized iodoform is slowly taken up from the anterior chamber even if the boundaries of the latter are diseased.

2. It undoubtedly exercises a mitigating influence not only in an eye in which tuberculous material is simultaneously introduced, but also in those eyeballs in which the iris had previously been tuberculous.

3. It is probable that the tuberculous process in the bulbi already tuberculous would have been less intense if the inoculation could have been made more thorough and kept free from unexpected deleterious complications.

4. Iodoform inoculation may bring about at least a temporary retardation of the tubercular invasion, and afford sufficient time to build up the general system enough to resist the invading bacillus. It is not incompatible with other remedies, but on the contrary needs them as adjuncts.

5. It is applicable in acute as well as in chronic cases.

A CASE OF MELANO-SARCOMA OF THE CHOROID.

By MATTHIAS LANCKTON FOSTER, M.D., of New York.

THE following case illustrates the difficulty sometimes met with in the diagnosis of this disease from inflammatory glaucoma, and so seems to me to deserve record.

A woman, forty-eight years of age, came to my office, August 22, 1898, on account of excessive pain in her left eye. She stated that she had never had any trouble with her eyes until about five weeks previously, when she was suddenly seized with intense and persistent pain in her left eye. Three weeks before she consulted me she entered one of the ophthalmic hospitals in this city, where an operation was performed. At the end of a week she left the hospital, though the eye was still inflamed and the pain continued. She asserted that on the day of the operation she could see with that eye, though not so well as with the other.

On examination of the eye, I found the vessels of the ocular conjunctiva engorged, the cornea slightly hazy in places, the anterior chamber apparently absent, a narrow, artificial coloboma in the upper part of the iris, with a prolapse of iris in each angle of the corneal cicatrix, and the lens partially cataractous, so that no view of the interior of the globe could be obtained. The tension of the globe was + 3. There was no perception of light.

The case appeared to be one of absolute glaucoma, in which a narrow iridectomy had failed to give relief, but had added complications in the form of two prolapses of the iris. As all perception of light had been destroyed, and it was very doubtful if satisfactory relief from the intense pain the patient was suffer-

ing could otherwise be obtained, I advised enucleation, and performed the operation a few days later at the Manhattan Eye and Ear Hospital. Dr. E. S. Thomson, Pathologist of the Hospital, furnished me the following report:

The eye, after hardening, was sectioned horizontally and the gross specimen showed the following points: globe of normal size; anterior chamber entirely obliterated; iris lying between lens and cornea with a few posterior synechiæ; ciliary body atrophied; lens opaque; retina totally detached, in funnel shape, and adherent to posterior part of lens; vitreous absent; a greenish sero-fibrinous exudate lying beneath the retina; a firm, deeply pigmented, disc-shaped tumor, about one inch in diameter, lying immediately to the temporal side of the optic nerve and a little below the equator.

The microscopic section showed all the above points in detail. The choroid, iris, and ciliary body were very markedly atrophic. The optic nerve was the seat of a leucocytic infiltration. The tumor was composed of round cells, with large nuclei, and was deeply pigmented throughout. It was moderately vascular, and seemed to spring from the layer of large vessels in the choroid. It was sharply defined, and no traces of extension could be found.

ELECTRO-MAGNETS FOR USE WITH THE 110-VOLT DIRECT-CURRENT LIGHTING CIRCUIT.

By A. B. KIBBE, M.D., Seattle, Washington.

THE annoyances incident to the use of batteries, either of the primary or storage type, for exciting small magnets such as are used by ophthalmic practitioners, are often serious. In the former, the necessity of frequent renewal of the exciting fluid, and in the latter, the trouble of having them charged, together with the more important fact that without using measuring instruments, ammeters and voltmeters, we have no guide as to whether or no our magnet coil is receiving the proper current strength, constitute objections sufficient to warrant one in looking for a more suitable source of energy.

Where available, we have in the direct-current lighting circuit, whether of the 110- or 220-volt variety, a means of exciting magnets which is not only constant in action and free from the annoyances incident to batteries, but which, in addition, provides us with an indication of the current flow. By the use of a current tap,[1] an appliance which is screwed into the ordinary lamp socket and which holds any size of lamp desired, we can obtain almost any strength of current and have in the glowing of the lamp an indication of the current's passage. Incandescent lamps allow approximately the following current strength to pass: 8-candle power, one-fourth ampere; 16-candle power, one-half ampere; 32-candle power, one ampere, and so on, but as lamps of more than 50-candle power are rarely used for general

[1] Made by J. C. Vetter, E. 23d Street, New York.

purposes, the latter will give us the limit ordinarily attainable—that is, one and one-half amperes.

More than a year ago I designed a form of hand magnet to be used in the way above described, and have found it so convenient and effective that I am led to call the attention of ophthalmic surgeons to its use. In its complete form it is seven inches in length and one and three-eighths inches in diameter. With the tips which I use, and which, as will be seen, are very different from those usually supplied, its lifting power is as follows: with a 32-candle power lamp in the current tap and, therefore, approximately, one ampere of current strength circulating in each turn of the wire in the coil, the smallest tip, one-eighth of an inch in diameter and four-fifths of an inch in length, and with a flattened face, sustains twenty-one ounces. One of the same dimensions, but one-fourth inch long, sustains fifty-three ounces. A tip one-fourth of an inch long, and one-fourth inch in diameter will lift more than seven pounds. With a 50-candle power lamp all these quantities are increased slightly.

The type of magnet generally in use is that known as the Hirschberg model, and from a recent statement by its designer[1] some idea of its strength in comparison with that which I am describing may be obtained. It should, however, be stated that such comparisons are not trustworthy unless the same tips and body acted upon are employed in each instance. According to this statement, the largest tip of the Hirschberg magnet holds easily one pound. Though in the case of mine a tip one-eighth inch in diameter and extending four-fifths of an inch from the magnet's face sustains twenty-one ounces, this does not necessarily imply vastly greater strength; for, as before stated, without using the same tips and object we cannot draw safe conclusions. In comparing this magnet with those in the shops which are said to be Hirschberg models, I found that mine was decidedly stronger. The shape of the tips, however, was not the same. This brings me to consider a very important point in the matter of tips for hand magnets. As regards shape, one is apt to be influenced by personal predilection,

[1] *Centralblatt für praktische Augenheilkunde*, Jan., 1898.

but one feature should always be borne in mind, namely, the shorter the tip the greater its attractive and sustaining power, and these qualities are correspondingly greater the larger the area presented to the foreign body. Quite as important as the shape is the manner in which the tip is connected to the magnet core. If made to screw in, the contact can scarcely be made perfect, and unless it is, the loss may be enormous if the butt does not reach quite to the bottom of the thread-hole. The best form of connection is a bevelled slot in the face of the core and a corresponding shoulder on the tip. This gives a broad and even contact, with no danger of an air gap. Tips may be made of any shape, but I have always used perfectly straight ones, four in number. One, four-fifths of an inch long and one-eighth inch in diameter, with its face flat, the edge being simply smoothed off. A second, the same dimensions but only one-fourth of an inch in length. Both are round. One similar to the first, but flat, having a thickness of but one-sixteenth of an inch. The fourth is one-fourth of an inch in diameter, round, with smooth edges at the face.

In six cases of particles of iron lodged within the eyeball, five were successfully removed with this magnet. One, which a radiograph showed to be shaped like a spear-point and having its base spread out like barbs on each side, was drawn up to the incision but could not be extracted without extensively enlarging the wound. As the eye was in a condition of irido-cyclitis and vision totally destroyed, enucleation was advised but refused. In one the particle had been in the anterior chamber three weeks and was very firmly adherent to the iris, which in turn was in firm contact with the lens. It required quite a perceptible pull for its removal. Three weeks later the patient had vision $\frac{20}{200}$ and the eye was free from irritation. In a third the particle was deep in the vitreous in upper and inner quadrant, as shown by radiograph. It was extracted at the first attempt and the eye preserved with vision equal to what it had been immediately following the injury, which was very little,—ability to count fingers at three feet. The piece was seven millimetres in length by two in width. In the remainder,

the particles were in the anterior chamber in two and in the lens in one. In only one was it necessary to introduce the tip into the globe.

The facility with which such a magnet lends itself to use in the lighting circuit led me recently to devise a larger instrument and one having, roughly, about three times the power of that previously described. Its weight, ten pounds, precludes its use as a hand magnet in the sense that the operator sustains its weight. It may be suspended above the patient, however, in such a way as to give the surgeon complete command over it and can be used with quite as much facility as the smaller one. It is fourteen inches in length and two inches in diameter, and is so wound that the 110-volt direct current can be used without any lamp, the connection being made direct. For convenience a current tap may be employed in the absence of proper arrangements and a 50-candle power lamp used, or a parallel tap may be used. From this we can take a full current and the lamp though not in the circuit with the magnet will still burn. These taps obviate the necessity and extra expense for wiring and are extremely convenient appliances.

In using this form of magnet, it is suspended by a ring attached as nearly as possible to its centre, thus permitting either end to be used. In this way the surgeon has practically no weight to hold and can manipulate it with great gentleness. The tips are attached to the core, which extends one-half inch beyond the wire forming the coil, at an angle of 45 deg., thus allowing a free view of the field of operation, the connection being, as in the case of the smaller magnet, by shoulder and slot.

Through the courtesy of Dr. Knapp I was enabled to make some tests of the attracting power of this magnet as compared with the Haab, which is used in the New York Ophthalmic and Aural Institute. For this purpose very small particles of iron wire were used and the distance at which they were attracted carefully measured. This, of course, varied with the weight of the particle and its shape. In general it was found that where the Haab magnet started the body at a distance of five inches my magnet exerted the

same effect at a distance of three inches. While such tests are crude in the extreme they do, nevertheless, indicate something as to the relative powers of the two instruments.

While the Haab magnet is to-day the most powerful instrument at our command for the uses to which it is put, it has its drawbacks, first among which is the lack of portability; the patient must be brought to it and the head held in a proper position, which is not always a simple or convenient thing to do. Delicacy of manipulation is also out of the question. The great cost is in addition another though decidedly minor objection when the welfare of the human eye is concerned. For these reasons I think the larger of the two magnets which I have described may find a place in the ophthalmic surgeon's armamentarium. The smaller one also has its uses even in the presence of the larger one, or even of the Haab magnet, for instances are not uncommon in which it has been necessary to employ the hand magnet when the Haab has failed. The necessary data for making the magnets I have furnished to Charles R. Borne, manufacturing electrician, 53 Rose Street, New York.

CLINICAL CONTRIBUTIONS.

[THE BICYCLE AS A CURE FOR EXOPHORIA—PAPILLITIS OBSERVED IN THE PROCESS OF ITS DEVELOPMENT—ANIRIDIA TRAUMATICA—TRAUMATIC PARTIAL PARALYSIS OF THE OCULO-MOTOR NERVE—TWO CASES OF EXTRACTION OF A PIECE OF STEEL FROM THE EYE BY THE GIANT ELECTRO-MAGNET.]

By Dr. KASPAR PISCHEL, San Francisco, Cal.

Case I.—**The Bicycle as a Cure for Exophoria.**

K., H., aged forty years, merchant. *Diagnosis.*—Mixed astigmatism R E, hypermetr. astigmatism L E. Strabismus divergens alternans. *History.*—Eyes always turned out alternately. Could never see very well. *Correction of Refraction* under homatropia (final result).—R E, $-$ 1.0 ⊃ cyl. $+$ 5.25 ax. vert. $\frac{5}{15}$; L E, cyl. $+$ 3.5 ax. vert. $\frac{5}{15}$.

Tenotomy of Left External Rectus.—After operation: In 50 *cm*, L E still turns out. In 5 *m* with red glass, homonymous diplopia. In stereoscope: sees with right eye only. Next day: Esoph. 2 prism dioptries; 40 *cm* Esoph. 5°. In stereoscope: sometimes binocular vision. Stereoscopic exercises ordered.

When patient presented himself again, five months afterwards, L E turned out on perimeter 30°; eyes sometimes straight; stereoscope: occasionally binocular vision.

I proposed another operation, but patient objected. During the following seven months he took up *bicycle riding*, riding every day several miles on the slot which is in the centre of a cable-car track. He told me at his next call that his eyes felt better. I was greatly surprised to find the following:

With Maddox rod in 35 *cm*: orthophoria; in stereoscope: generally binocular vision. Two months later: orthophoria; stereoscope: binocular vision.

For this extraordinary improvement of the exophoria I could

not find any other explanation but the strengthening of the adduction by the daily exercise. In riding a wheel over a cable slot one has to concentrate one's eyes and thoughts upon the small strip in front of the wheel, which may have a strengthening influence upon the adduction, counteracting the exophoria.

CASE II.—**Papillitis Observed in the Process of its Development.**

R., E. V., thirty-one years old, masseur. *History.*—According to the report of Dr. M. Rothschild patient perfectly healthy. Five days ago noticed that sight of the right eye was not so good as that of the left. Since then sight of right eye steadily worse, so that to-day he cannot see anything with that eye. Has always been healthy.

Present Condition.—L E, Javal ophthalmometer shows 0.5 astigm.; vision: $< \frac{5}{15} + 3.0 < \frac{5}{6}$, reads + 2.5, $\frac{15}{50}$, $\frac{60}{150}$; fundus normal. R E, candle; projection unreliable; fundus, nothing pathological to be seen; Javal, 0.5 astigm.

Treatment.—Kali iodat. Five days after first observation, no projection of light; fundus, some vessels on disk bent. Seven days after f. o., candle light not seen; electric light seen; no projection of light; fundus: disk dim, borders effaced, some swelling.

Treatment.—Inunctions of hydrarg. were added to K. I. Ten days after f. o. fingers in 10 *cm;* fundus: swelling of disk increased, hemorrhages upwards.

13 days: fingers in 10 *cm;* fundus same as last time.
15 " " " 20 *cm.*
20 " " " 20 *cm;* movement of hand in 2.5 *m.*
25 " " " 50 *cm;* fundus: swelling diminished; hemorrhages nearly all disappeared.

29 days: fingers in 60 *cm*, $< \frac{1}{30}$.
36 " " " 2.25 *m*, $\frac{5}{60}$, $\frac{1}{12}$.
40 " $< \frac{5}{30}$, $\frac{1}{6}$.
47 " $< \frac{5}{30}$, $\frac{1}{6}$.
61 " $< \frac{1}{6}$, $\frac{5}{60}$.

Treatment.—As the sight appears to be decreasing again, prescribed strychn. nitr. $\frac{1}{30}$ gr. pills; three pills a day.

89 days after first observation, $\frac{5}{30}$, $\frac{1}{6}$.
6 months after first " $< \frac{5}{21} - 10 < \frac{5}{15}$.
7 " " " " $- 1.0 < \frac{5}{12}$; disk pale, borders sharp.

CASE III.—**Aniridia Traumatica.**

C. P., aged thirty. *History.*—Three days ago right eye was struck by an acorn thrown by a boy.

Status Præsens.—Vision: fingers in 1.5 *m* + 1.0 fingers in 2.5 *m*; whole iris like a worm rolled up in bottom of anterior chamber; lens dislocated downward; upper periphery in centre of pupil; some gray radii in lens; many opacities in vitreous; tension increased; fundus normal.

Operation.—Iris removed, when a pearl of vitreous appeared; patient kept in bed; pilocarpin drops. *Thirteen days afterwards:* eyeball pale; tension slightly increased; a little blood in posterior surface of cornea; in scar of limbus downward rest of iris; in lens, especially in posterior capsule, opacities; lens in normal position; external border turned forward, rest of iris removed. *Twenty days* after operation: fingers in 2.5 *m* + 1.0 fingers in 3.5 *m*; tension lower for last few days; to-day higher.

Fifty-five days after: fingers in 2.5 *m* + 1.0 fingers in 3.5 *m*; tension increased, after eserin diminished.

Seven months after accident: vision $< \frac{5}{21}$, tension slightly increased.

CASE IV.—**Traumatic Partial Paralysis of the Oculo-Motor Nerve.**

B., F., eighteen years old. An hour ago in stooping suddenly stuck a bill file into his orbit. *Right eye:* sight $\frac{6}{6}$, with $-0.5\ \frac{6}{6}$. *Left eye:* just above inner canthus, in the middle between that and the eyebrows, small opening in the skin, 1.5 *cm* deep. Lid fissure 4 *mm* against 10 *mm* of right eye. Eyeball deviates outward 15° on perimeter. Pupil 6 *mm* without reaction against 3.5 *mm* of right eye. Sight: $\frac{6}{6} + 1.0\ \frac{6}{6}$: reads with $+ 4.0\ \frac{25}{16}$. Fundus normal. Crossed double images in 4 *m*. In 65 *cm* distance image of left eye a little higher. Movement of eye impeded inwards and upwards in which direction the distance of double images increases. *Two weeks later:* Left eye: $\frac{6}{20}$ Hm. 1.0 + $4.0\ \frac{25}{100}$; Lid opening 7 *mm* against 9 of right eye: Pupil 5.3 against 3 *mm* of right eye, sees single. *Two months after accident:* Left eye: lid opening 9 *mm* against 9.5 *mm* of r. e.; pupil 4 *mm* against 3 *mm* of r. e.; sight: $\frac{6}{9} + 0.5\ \frac{6}{6}$, reads $\frac{30}{100}$, Esophoria 1. Hyperphoria of r. e. 1.

CASE V.—**Two Cases of Extraction of a Piece of Steel from the Eye by the Giant Electro-Magnet.**

1. F., A., aged twenty, stated that yesterday while he was

splitting wood a piece of an iron wedge flew into his left eye. Moderate pain since. I found: Ciliary and conjunctival injection; from corneal wound gray stripe to iris wound; cataractous lens; Hypopium $\frac{1}{2}$ *mm;* iris discolored; no red light from fundus; projection of candle-light good. Eye somewhat sensitive.

I told patient that the eye was probably lost because infection had already taken place. The magnet brought the foreign body quickly from the depth of the eye into anterior chamber. After some manœuvring the piece was extracted from the wound, into which a more pointed tip of the magnet had been introduced. The foreign body proved to be a leaflike, very thin, almost round piece of steel with notched edges, weighing one centigramme (= $\frac{1}{6}$ grain) and measuring 3 *mm* in diameter. Two days after operation: Panophthalmitis; swelling of lid, pupil filled with yellowish masses, tension heightened. Therefore evisceration of bulbus. The whole eyeball was filled with yellowish matter. Uneventful recovery.

2. A. D., aged thirty-five, stated that a week ago when hammering an iron hoop of a fish barrel upwards something struck his right eye; since then could not see so well; eye had been irritated for two days only.

Condition on Presentation.—After atropia, sight: + 2.0 $\frac{5}{15}$ Kerat; image only slightly irregular. Slight ciliary injection; pupil dilated ad maximum; 2 *mm* below centre of cornea horizontal gray scar, 1 *mm* long. Similar brown scar a little outside of anterior pole of lens; posterior pole shows gray cataractous cup; fundus normal.

After cocaïne, giant electro-magnet applied without result; patient did not feel anything. Next day without cocaïne patient sometimes felt a drawing pain while large magnet was applied on closed lids. After cocaïne, large magnet applied from above drew iris upward toward centre, but the object attracted could evidently not pierce the iris; therefore with triangular knife paracentesis from below. Small (Hirschberg —) magnet introduced could not pull away the piece from the iris. Pointed tip of large magnet introduced into wound drew piece into irido-corneal angle from which it was taken out by small magnet; iris reduced; eserin. Lens in lower half of anterior corticals shows now some gray lines radiating from the above mentioned scar of the anterior capsule, which now appears gray. Following day: one posterior synechia at spot of opacity of lens; atropine. Moderate irritation.

The foreign body extracted was a small piece of iron, almost round, with one sharp point, weighing only 0.00062 gramme.

As the brown coloring of the scar in lens had disappeared after the extraction of the foreign body, I must assume that it was hidden behind it in the lens, which is corroborated by the appearance of the gray streaks in the cortical of the lens and the formation of a posterior synechia on that spot. The irritation passed off in a few days. Two weeks later: eye pale. Sight: + 1.0 $< \frac{5}{15}$.

CLINICAL OBSERVATIONS ON A CASE OF PARTIAL INCOMPLETE COLOBOMA OF THE IRIS.[1]

By Dr. ARTHUR GLOOR,

ASSISTANT IN THE LABORATORY.

Translated and Abridged[2] by MATTHIAS LANCKTON FOSTER, M.D., New York.

CONGENITAL anomalies of the iris are not rare. Typical and atypical colobomata are frequently observed, irideremia appears now and then, anomalies in which the different layers of the iris are usually similarly affected. But those cases are of great rarity in which these layers are affected differently or in which only one is involved. The following case belongs to the latter class:

A girl, six and a half years of age, was brought to the hospital for advice regarding several deformities. Her mother had almost complete ptosis of the left upper lid, which had been operated on three times with only temporary benefit, and had limited motility of the left eyeball, except as regards the action of the abducens and the obliqui. A sister had had rhachitis. Otherwise the family history was negative.

Nothing abnormal in her appearance was noticed at birth. When two and a half years of age she had scarlet fever. At this time a discharge appeared from her right ear and then, according to her mother's statement, the right side of her face and especially the right upper lid became swollen and blue. This color soon disappeared, but the swelling, on the contrary, increased. The right auricle also became enlarged. During the last six

[1] Communication from the University Eye Clinic of Prof. Carl Mellinger in Basle.

[2] From vol. xxxvii., p. 159, etc., 1898, German Edition.

months an increase in size of all the enlarged parts had been visible.

On account of this history the patient was admitted to the hospital June 3, 1897, where she was under observation for a few days, during which no change in her condition and no indication for therapeutic intervention appeared. On November 12, 1897, her condition was still unchanged.

The right side of her face was more developed in all parts than the left and presented the appearance of having been shoved forward and downward, so that the approximately horizontal lines of the mouth and nasal apertures sloped precipitately downward toward the right. The right halves of the upper and lower jaws and of the tongue were also larger than the left so that their median lines appeared to be pushed over to the left. The malformation of the right ear was due to enlargement of the spina helicis and of the tragus, which appeared as thick, soft growths and almost occluded the meatus. The right foot was flat and considerably larger than the left, which was not flat. The legs 3 *cm* above the malleoli were of the same size.

The right upper lid hung loosely down over the eye, leaving only a small palpebral fissure *2 mm* wide at its nasal end, a width which could be increased to 4 *mm* by exertion. In its temporal portion the lid was much thickened and partially overhung the lower lid. Its integument was unchanged and it was not sensitive to pressure.

The palpebral conjunctiva was normal. In the upper, outer part of the bulbar conjunctiva was a thickening with a rough, sago-like surface which could be felt through the lid. The eyeball was free from irritation.

The cornea was clear except on its upper and outer border where there was present a serrated, whitish cloudy zone about 1 *mm* broad, over which conjunctival vessels extended and ramified. This serrated opacity was apparently the result of a former inflammation.[1]

The anterior chamber was of normal depth.

The bright gray iris, sprinkled with dark, brownish little spots, existed only as a peripheral ring bounded centrally by an irregular, serrated line. The dark, central space which appeared to be the pupil, occupied about two thirds of the vertical diameter of the

[1] [This closely resembles the condition sometimes present in imperfectly developed eyes and denominated by von Ammon "fœtal ring." It is probably of developmental rather than inflammatory origin.—F.]

cornea, leaving less iris above than below, and reacted to light. By oblique illumination a dark-brown membrane could be seen to fill this space and to present a round space with sharply cut edges which also reacted to light,—the true pupil in its normal position. Through this the fundus of the eye could be examined while the membrane itself appeared as a perfectly opaque, black veil. The margin of the defect in the parenchyma of the iris presented spurs extending toward the centre, joined by slightly curved lines arching toward the periphery. By the aid of Westien's lens traces of two concentric folds could be seen in the lower-outer part of the iris, as well as radiating bands in the dark-brown membrane, the same as those described by von Ammon [1] and by Iwanoff and Arnold [2] as "radiating shallow folds which extend regularly in straight lines from the pupillary to the ciliary border. Their number amounts to seventy or eighty." Von Ammon states that these marks can be seen with equal clearness whether the pigment layer be or be not removed from the uvea. Probably this may be determined therefrom, that the uveal pigment layer is closely adherent to the lower surface of the iris so that it may follow the movements of the latter in contraction and expansion without suffering injury.

Ophthalmoscopically the media were clear and the fundus normal. The motility of the eye was good. The vision = $\frac{1}{10}$, not improved by glasses.

Left eye. Nothing abnormal was noticed internally or externally. The vision = $\frac{8}{8}$, not improved by glasses.

Under the influence of a mydriatic the pupils became symmetrically enlarged, the spurs in the margin of the defect were evened off, and the uveal layer could be seen by direct illumination only as a small, black, concentric band within the border of the iris. Inversely both the apparent and the true pupil became smaller after the use of eserine, which demonstrates that the uveal layer contains muscular elements. The outer pupil changes in artificial mydriasis and myosis so that the spurs, which in its natural condition project toward the centre, retract, while the curved lines between them now arch toward the centre. If the existence of a dilator pupillæ is assumed we can consider these spurs to be composed of groups of fibres of this muscle which by their natural elasticity contract strongly during paralysis of their antag-

[1] *Arch. für Ophthalmologie*, 1858, iv., p. 122.
[2] Graefe-Saemisch, *Handbuch*, i., p. 283.

onist in atropine mydriasis, and also contract during eserine myosis because they are irritated and induced to do so the same as the sphincter.

There was no trace of a coloboma of the choroid, retina, or lens. The anomaly was a complete irregularly ring-shaped absence of the connective-tissue layer of the iris about the pupil, in which the parenchyma approached most nearly to the pupil on its inner side. Following the example of Manz [1] we speak of this as a "Coloboma partiale incompletum seu superficiale," but the anomaly would be better described by the title "Aniridia partialis superficialis congenita."

Slight mention is made in modern text-books, or by authors who have written on colobomata, of such anomalies as this. There seem to be only six similar cases to be found in literature.

Von Ammon [2] described and pictured in his atlas a case observed by Dr. Schön, of Hamburg, of "congenital partial absence of the parenchyma of the iris with integrity of the uvea." This case bears the closest resemblance of any to the one herein described. The picture clearly shows the absence of the parenchyma of the iris downward and outward from the pupil, and the sepia-brown uveal membrane with its radiate striations completing the contour of the pupil.

Manz [3] described a coloboma of the usual form directed downward in each eye, the point of which was covered posteriorly by the uvea so as to render the coloboma at that place incomplete.

Makroki [4] observed a coloboma directed outward, ending near the ciliary border, with a rounded point, incurved margins, and radiating striæ posteriorly, rendered visible by oblique illumination.

In Reuss's [5] case there was a dark, triangular space in the lower part of the iris, where the tissue was at a deeper level than the surrounding iris and presented no radiating striæ.

Treacher Collins [6] reported a case of which *Nagel's Jahres-*

[1] Graefe-Saemisch, *Handbuch*, ii., p. 63.
[2] *Klinische Darstellung der angeb. Krankh. d. Aug.*, Tab. x., Fig. xix.
[3] *Jahresbericht für Ophthalmologie*, 1876, p. 216.
[4] *Ibid.*, 1881, p. 235. [5] *Ibid.*, 1886, p. 219. [6] *Ibid.*, 1892, p. 213.

bericht says in an abstract of his article: "The coloboma was half closed by a membrane which showed a double pigment layer on its posterior surface." The abstract of this article is not clear, and the original could not be obtained.

Bock[1] examined microscopically a pig's eye which presented a coloboma of the iris, ciliary body, and choroid, in which half of the portion of iris remaining peripherally from the coloboma was very thin, with perpendicular edges of demarcation. The tissue there consisted not only of the uvea, but of a tissue unusually rich in pigment.

Beyond doubt the malformations in this case were congenital. The statements of the mother to the contrary can hardly be credited. Immediately after birth such malformations would scarcely be noticeable on account of the small size of the organs, and it is quite possible that even if the enlargement of the right side of the face, for example, was present at birth it would become more apparent as the child grew. The condition of the eye itself was not noticed on account of the ptosis, and that the latter escaped the notice of the mother, who at least did not mention it, is not so very surprising when we remember that many striking symptoms, *e. g.*, otorrhœa, are frequently unremarked by mothers who are not negligent.

As regards etiology, the condition of the mother's eye suggests a hereditary tendency to such malformations. It is important to remember that in this case the anterior layer of the iris alone was involved. The lens, ciliary body, choroid, retina, and optic nerve showed nothing abnormal. It was in no way connected with, but must have been formed subsequently to the closure of, the fœtal cleft. If inflammation had been the cause, some other trace of its action should have been observable, which was not the case. The explanation may rather be the involvement of the missing tissue in the removal of the pupillary membrane, or in the non-development of a part of the parenchyma on ac-

[1] *Die angeborenen Colobome des Augapfels*, p. 55, Case xxi.

[To this list of cases should now be added the case of partial aniridia reported by Dunn, in the *Annals of Ophthalmology* for April, 1898, in which still less of the parenchyma remained. As in the present case, there was no evidence of the presence of a coloboma, in the usually accepted meaning of the term, and the radiate striations of the uveal layer were well marked.—F.]

count of faulty nutrition. The pupil of the uveal layer reacts promptly to the influence of mydriatics and myotics, hence elements of a sphincter pupillæ must be present. Whence do these originate? Evidently from the connective-tissue layer of the iris, for, according to Iwanoff and Arnold,[1] the sphincter is separated from the uvea only by a thin layer of connective tissue and the very delicate muscular tracts of the dilator. It may be that the iris became developed to a certain point, that then the process of absorption of the vessels of the pupillary membrane overstepped its usual bounds and produced the defect now present, while the sphincteric portion clung to the uveal membrane and was saved. But why the destructive process thus ceased cannot be told.

The other deformities present stand in some relation to the malformation of the iris. Whether it was the impulse of heredity or some other cause which occasioned these trophic disturbances is uncertain, but anomalies of the iris occur frequently with other inflammations of the body, as in the cases reported by Humphrey[2] and Ebenhardt.[3]

[1] Graefe-Saemisch, *Handbuch*, i., p. 283.
[2] *Jahresbericht für Opthalmologie*, 1870, p. 213.
[3] *Ibid.*, 1889, p. 190.

[Speculations on the etiology of these defects, based on the study of single cases, are seldom of value. Dr. Gloor favors the theory of involvement of the iris in the involution of the pupillary membrane, which was first suggested by Behr to explain the occurrence of irideremia and has since been proven not to be the cause, in all cases at least. Dr. Dunn attributed the condition in his patient to atrophy from pressure incident upon the glaucoma which was present. The true etiology can be determined only by a careful study of many more cases than have as yet been brought to our notice.—F.]

TWO CASES OF IRIDOTOMY UNDER DISCOURAGING CONDITIONS.

By Dr. F. M. WILSON, Bridgeport, Conn.

(*With a figure on text-plate IX.*)

Case 1.—"Clinton B., age fourteen months, Sept. 30, 1886. Right eye pierced with scissors, one week ago. Wound in ciliary region, temporal side. Prolapse of iris and part of ciliary body. Prolapse cut off under ether. Eserine and pressure bandage."

Dr. C. H. Beard, of Chicago, made the above notes while in charge at my office in 1886, and he also said "that right eye would undoubtedly go on to phthisis bulbi," and that was the result. I saw the case at intervals up to May, 1888. The atrophied right globe was then quiet, and the left eye was normal. L V = $\frac{10}{20}$. Then for five years I did not see him at all. But on Sept. 22, 1893, his father brought him to the office with plastic iritis well established in the left eye and vision down to $\frac{6}{200}$. Atropine pushed to production of slight delirium had no effect on the total posterior synechia. Under ether enucleated the right atrophied globe. His vision slowly improved, and on Nov. 13, 1893, had come up to $\frac{20}{100}$.

January 11, 1894, his vision was down again to $\frac{10}{200}$. There was complete posterior synechia, exudation in pupil, opaque capsule, slightly diminished tension.

December 18, 1894, Dr. C. S. Bull saw him and advised operation "if good projection persisted after the lens became opaque."

January 9, 1895.—His vision was down to large moving objects.

January 30th.—L V = P L; good field.

February 10th.—I attempted an iridectomy. The globe was soft, the iris atrophied, and seemed to be adherent to the capsule

Right Eye of Thomas Farrell.
Photographed by Dr. Leonard Waldo, June 2, 1898.

throughout its whole extent. I succeeded in getting out a few shreds of iris, but not enough to be called an iridectomy, and abandoned the undertaking.

From March, 1895, to October, 1897, this boy was admitted to the Bridgeport Hospital ten times, each time remaining about a week. At each visit, except one, a small straight knife (which the house staff for want of a better name call "The Baby Graefe"[1]) was thrust through the cornea 3–4 *mm* from its margin, through the mat of tissues in the pupil, and *into* the lens. A single short sweep in one direction was made with the handle (trying to avoid the iris but sometimes cutting it), and the knife withdrawn. After each operation there was marked reaction. The iris became covered with yellow exudation, and the end seemed near, but the quick perception of light in all parts of the field persisted, and so we went on.

On the ninth visit I attempted a hook operation, but the mat of tissue was so firmly attached that I did not dare to use force enough to pull it out. Up to this point I am reasonably certain that no instrument had entered the vitreous, but at the tenth attempt I thrust the small knife well into the vitreous and made a little longer cut than usual. For the first time this cut "showed black." There was very little retraction of the lips of the cut at first, but this slit did finally open out into a broad oval pupil with the long diameter horizontal and about 4 *mm* in length. For several weeks after the last operation his vision did not exceed $\frac{1}{200} - \frac{2}{200}$, but slowly improved, and six months later was $\frac{5}{200}$.

Case 2.—Thomas Farrell, age fifty-seven, July 31, 1897. He tells me that about two months ago his right eye was "operated on for cataract," and that several days after the operation he got up in the night, and in stooping over hit the right eye against something so that he "saw stars."

Present Condition.—Right eye pulled up pupil. Slight ciliary injection. R V = P L; good field.

Left eye well established plastic irido-choroiditis. Pain for ten days. Ciliary injection. Discolored iris. Exudation in pupil and on iris. Almost complete post. synechia; lens cataractous. L V = large moving objects.

I watched this left eye for five months, but in spite of all treatment it got steadily worse. Sight was totally destroyed, and on

[1] Blade of knife is 13 *mm* long and as slim as it can be made and have high-grade edge.

January 12, 1898, I enucleated it. Two weeks later, on January 26th, with the small straight knife—"The Baby Graefe"—I did iridotomy on the right eye. The knife was entered about 3 *mm* from the temporal margin of cornea, and a central horizontal cut made in the pulled-up iris. This cut instantly snapped open into an oval black pupil, and there happened to be just enough tension to later pull this opening into a roughly circular form.

February 14, 1898.—His right vision w + 10 D = $\frac{20}{70}$.

May 8th.—His right vision w + 10 D = $\frac{20}{60}$ +.

REMARKS.

We have here in the *first* case the unusual survival of an eye with sympathetic plastic inflammation, and the still more remarkable survival of the same eye after so much surgery (one hardly knows whether to be proud or ashamed after doing so many operations to one eye). It must be borne in mind, however, that the step from helpless P L to $\frac{5}{200}$, and the ability to avoid obstacles, is a much longer one than from $\frac{5}{200}$ to $\frac{10}{200}$.

Another fact worth mentioning is that in this soft eyeball a horizontal slit through a mat of iris and inflammatory material, although it did not open at the time it was made, did finally widen out into a central oval pupil.

In the *second* case we have the unusual survival of an exciting eye after having destroyed its fellow-eye by sympathetic inflammation, and we also have the still rarer result of the preservation of good vision, viz., $\frac{20}{60}$ +. That this pupil is so nearly round is an accident of tension in the fibres of the pulled-up iris. The illustration from photograph taken June 2, 1898, shows how nearly central and circular the pupil is.

CLINICAL EXPERIENCE WITH HAAB'S POWERFUL ELECTRO-MAGNET.[1]

By Dr. HERMAN KNAPP.

OUR experience with strong electro-magnets is still limited so that even a smaller number of cases may be worthy of publication. In America only a few observations on its use have been made known. These briefly summed up, as far as they have come to the notice of the writer, are the following:

Dr. J. A. Weeks,[2] New York, describes a successful extraction of a chip of iron from the vitreous through the canal of entrance, which was at the corneo-scleral junction, without injury to the lens.

Dr. A. Barkan,[3] San Francisco, four cases.

I. Chip of iron from a horseshoe entered through the sclerotic. Extracted through the opening of entrance, twenty-four hours later. Suppuration. Enucleation. The foreign body evidently was infected.

II. Chip of iron, fastened in the cornea, projected into the anterior chamber. It was readily attracted by the magnet. Perfect recovery.

III. Chip of iron entered into the vitreous through cornea and lens. Extraction through the entrance canal. Recovery. The offending minute particle of metal was easily detected before the operation; it moved readily with the eyeball. Fundus clear and intact. Tn. V $\frac{20}{200}$. The first

[1] Communicated in abstract to the Section on Ophthalmology and Otology of the New York Academy of Medicine, March 20, 1899.

[2] Archives of Ophthalmology, xxvi., p. 85, 1897.

[3] Archives of Ophthalmology, xxvii., p. 37, 1898.

closing of the circuit for ten minutes had no effect. Opening and then closing it again at once brought the foreign body into the anterior chamber, from which it was extracted by the tip of Haab's magnet introduced into the corneal wound. The details of this case are very instructive.

IV. Piece of steel entered and was extracted through the pericorneal space. On its way back it pushed the iris forward. After a small excision of the iris had been made, the magnet drew the piece out easily. Complete recovery. V $= \frac{20}{20}$.

Dr. Weeks[1] describes two other cases.

I. Penetrating wound of 3 *mm*, at the lower corneal margin. Small black spot seen at bottom of anterior chamber. Wound enlarged. Small magnet no effect. Large magnet elicited pain and made iris bulge. When, by a second incision, the wound assumed T-shape, the magnet drew out the foreign body. Recovery. V $= \frac{1}{8}$.

II. Wound, 6 *mm* long, in lid and ciliary region. Large magnet caused pain, slightly rotated the eyeball, but did not extract the iron. Later enucleation. A linear wound on temporal side of optic nerve occupied by the chip of iron, which measured 6.5 *mm* by 1 *mm*.

In another case of A. Barkan[2] a large piece of steel was successfully extracted, but the patient, a heavy drinker, died of delirium tremens.

P. A. CALLAN, in a paper, "The Haab Electro-Magnet as a Sideroscope,"[3] details four cases:

I. Piece of iron entered into the vitreous through cornea and lens; iris intact. The presence of the piece of iron was recognized by a bulge of the sclerotic toward the point of the magnet. Patient refused operation. Three months later the patient was seen again, having a very irritable eye from irido-choroiditis.

II. Entrance through cornea, near limbus. White exu-

[1] *Transactions of the Section on Ophthalmology of the American Medical Association*, forty-eighth annual meeting, 1897, p. 56.

[2] ARCH. OF OPHTH., xxvii., p. 181.

[3] *Transactions American Ophthalmological Society*, vol. viii., part 2, p. 456, 1898.

date seen in vitreous from horizontal meridian to a dark mass at the bottom. Patient approached to the electro-magnet, felt acute pain, referable to the lower part of the globe. The foreign body, visible with the ophthalmoscope, was extracted through a scleral incision with the *small magnet* after several introductions. Its size 1 by 1.5 *mm.* On discharge, six weeks later, inflammation gone; fundus reflex can be gotten. V = fingers.

III. Chip of iron entered two months before patient presented himself. Cornea clear, iris irregular, synechiæ, cataract. Sight vanished ten days ago. Large magnet caused an abnormal sensation, and iris could be seen to bulge forward against cornea in superior-outer quadrant. Iridectomy, extraction of lens together with foreign body. In nine days eye quiet. V = 0.

IV. Chip of steel entered through lower part of cornea and iris. Lens cataractous in lower part. Electro-magnet, after a number of trials, caused the sclera below the cornea to bulge. Inflammation developed. Three days later incision in inf. temp. quadrant through sclera, followed by a few drops of vitreous. Tip of small magnet withdrew foreign body at first introduction. Panophthalmitis. Enucleation.

V. Entrance two weeks before presentation. Iritis. Cataract. V = 0. Operation, ether. Section with Graefe's knife one half of limbus. Extraction of lens with iridectomy. Exudate in vitreous visible. Small piece of iron extracted with small magnet. Globe tender; shrunken. V = 0. Enucleation refused.

Dr. CASPAR PESCHEL[1] of San Francisco publishes two cases, one successful, in the present number of these ARCHIVES, p. 155.

To the foregoing 15 cases, I can add 13 which occurred in my own practice since I had a Haab magnet put up in the N. Y. Ophthalmic and Aural Institute, May, 1898. I shall present the cases not in their chronological order, but in groups of similarity in kind.

[1] "Clinical Contributions," ARCH. OF OPHTH., vol. xxviii., p. 153, 1899.

FIRST GROUP: **Foreign bodies visible in the anterior chamber;** 2 CASES.

CASE 1.—**Chip of steel in periphery of anterior chamber. Beginning iritis. Extraction by large magnet through entrance canal. Perfect recovery.**

Mr. F. A. Goldthwaite, twenty-five years, N. Adams, Mass. While hammering iron, he felt that his eye had been hit. No particular pain, sight not materially impaired. In a week, while under treatment by a physician, the eye became somewhat red and painful. Then he came to Dr. Wright, of N. Adams, May 24, 1898. Dr. Wright told him that his was a case for a large magnet, an instrument not in his possession. He referred him to me, and the patient came to the clinic the next day.

When he presented himself the iris was discolored, the eye irritated, tearing. At the periphery of the anterior chamber, near the horizontal meridian, a small black spot was seen at and behind a small corneal wound with yellowish-gray borders. S normal. The patient's eye was cocainized, carefully moved to the tip of the Haab magnet, so that the traction line of the instrument was kept as far as possible in the direction of the corneal wound canal. When the tip was about 4 *mm* from the eye the black spot began to tremble, and when it came a little nearer to the tip it passed through the wound and flew to the tip of the magnet where it stuck out like a needle. It measured 3 by 2 *mm*. The patient had atropine instilled, kept his bed for a few days, and went home on the sixth day. $V = \frac{20}{20}$.

This is a case as gratifying as it is simple. It shows that the large magnet can draw out small foreign bodies through the wounds of entrance without dilating them. I dare say that in other cases a dilatation, even a T-shaped opening, may be necessary, but we should try first whether the foreign body will not come out through the opening it itself made. Lateral traction with the powerful magnet must be carefully avoided. The large magnet, to judge from the case under observation, seems to be particularly adapted to attract iron foreign bodies that have pierced the cornea with one end, but remain fastened in it with the other. These cases are difficult to manage with the ordinary instruments and do not always yield kindly to the

mild attractive power of a small magnet, as the following example will demonstrate.

CASE 2.—**Piece of steel seen in anterior chamber; attempts at extraction with small magnet unsuccessful. Hemorrhage. Foreign body disappeared, not indicated by large magnet. Eye blind.**

Mr. D. Hunter, æt. twenty-five, New York. January 27, 1899, while he was hammering a nail, a particle struck and entered his left eye. No particular pain or dimness of sight. During the night pain began, not severe; claims to have been able to see well then. On January 28th he went to an eye hospital, where the foreign body was seen lying in the anterior chamber. A corneal section was made down and inward, and the foreign body attracted by a small magnet, but attempts at removal proved unsuccessful. The foreign body lodged in the iris, was dislocated by the handling, and could not be seen again, as the eye filled with blood. Pat. was brought to the "Institute" by one of the surgeons of the other hospital. The eyeball was much injected, the anterior chamber full of blood. The large magnet did neither attract nor indicate the foreign body. The tip of the smaller magnet was introduced into the anterior chamber through the old corneal section, but without result. Eye bandaged, patient put to bed.

Blood absorbed and inflammation soon stopped. Another approach of the eye to the large magnet negative. Patient discharged February 10, 1899. February 18th, seen again. Anterior chamber free, iris torn above, and drawn downward, an opening also below. Vitreous full of blood. Tension normal, perception of light defective above and nasally. Enucleation refused.

This case is by no means isolated. Many a foreign body that pierced the cornea has fallen into the sinus of the anterior chamber and, aided or unaided, was buried in the head of the ciliary body, destroying by irido-cyclitis, the eye which harbored it, and in certain instances also the other by sympathy.

SECOND GROUP: **Foreign bodies in the depth of the eye.**

A.—Such as can be seen with the ophthalmoscope.

Of those I can offer here no example. The large magnet shares this field with the small. A few very gratifying examples of cure with the latter occurred in my former practice;

a successful one was operated on two months ago at the N. Y. Ophthalmic and Aural Institute by Dr. R. O. BORN.

B.—Cases where iron foreign bodies are surely within the eye, but are not indicated by the magnet.

CASE 3.—**Chip of steel entered through cornea, pupil, and lens, not indicated by magnet. Enucleation. Small piece stuck in sclerotic near optic nerve.**

Albert Capelle, æt. forty-eight, New York. Entered clinic, May 13, 1898. Left eye struck with a piece of steel from a chisel, April 26, 1898. The piece passed through cornea, pupil, and lens. Irido-cyclitis. V = P L. The eye was held before the magnet, brought in contact with tip at cornea and surrounding sclera; nowhere the patient felt pain or any other sensation. Enucleation, May 13, 1898, eighteen days after the injury. The globe held before the magnet was attracted and suspended when the tip was at a certain point near the optic nerve. This point was marked by a small black spot, the foreign body.

CASE 4.—**Piece of a nail in eye eighteen years. Eye quiet, some sight left. Then irido-cyclitis. Hypopyon of 2 *mm* in height. Siderosis. Examination with large magnet negative. Enucleation. Globe adhered to magnet at lower part.**

Mathew Bele, æt. fifty-one, New York. According to patient's statement a piece of nail entered the eye, eighteen years ago. No reaction followed, the eye was perfectly white, quiet, with some sight left, until ten weeks ago, when it became painful, inflamed, and sightless. **On admission,** there was a corneal scar near nasal margin, marked ciliary injection, iris rust-colored, pupil closed, a scar in nasal part. White sediment of 2 *mm* at bottom of anterior chamber. Field defective in upper part. Patient when the eye was brought in contact with the magnet had no sensation of pain. **Enucleation.** The globe was attracted and suspended when the tip of the magnet was brought in contact with the lower part of the sclerotic, just behind the ciliary region, and nowhere else. This proves that the foreign body was of iron and so tightly adherent to the lower wall of the globe that the magnet could not dislodge it. The recovery from the enucleation normal.

In order to determine the nature of the sediment in the anterior chamber, I made a small paracentesis, gathered a few drops of the muddy aqueous, made cover-glass specimens of them, charged some gelatine tubes with them, and inoculated a rabbit's eye after removing the lens. All these tests for bacteria were negative. The cover-glass specimens showed nothing but leucocytes and granular detritus.

CASE 5.—**Subacute purulent irido-choroiditis from chip of iron in eye, not indicated by magnet. Enucleation. Globe attracted by magnet after enucleation.**

Jos. Papooz, æt. twenty-five, Poughkeepsie, N. Y. Entered November 14, 1898, two weeks after the injury. Was in hospital in Poughkeepsie, left because enucleation was insisted on. Came to have all means tried before having eye removed. The eye showed a plain picture of purulent irido-choroiditis. Repeated trials with magnet negative. Enucleation, November 19, 1898. Magnet attracted the enucleated globe.

These three cases are parallel observations and instructive, exemplifying the well-known fact that the largest magnets at our command are not powerful enough to move foreign bodies which are firmly imbedded in dense unyielding tissue. If they are small and in the posterior part of the eye they betray their presence in no way, but when they are larger or in the anterior part of the eyeball, the latter is attracted by the magnet, adheres to the tip when in contact, and shows a small bulge of the sclerotic on withdrawal from the magnet.

THIRD GROUP: **Iron foreign body suspected. Examination with magnet negative. Recovery under expectant treatment.**

Of this group I cite only one case as a representative example.

CASE 6.—Jas. Binny, æt. thirty, Passaic, N. J. Entered hospital November 30, 1898. Right eye struck with piece of iron four weeks ago. No immediate pain or marked impairment of sight. Five days ago pain set in and sight began to fail. Circumcorneal injection; cornea clear. Iris muddy; slight hypopyon. Cyst-like protrusion of wound. V = P L. No fundus reflex. Large magnet failed to indicate presence of foreign body. Patient put to bed. Eye bandaged; atropine. December 2d: Hypopyon disappeared, other symptoms ameliorated, no pain. Daily improvement; staphyloma flattened. Discharged December 18, 1898. V = $\frac{20}{200}$. Seen March 20, 1899. Pear-shaped pupil, even scar, pupil and fundus clear, no discomfort. V = $\frac{20}{30}$.

The negative result of the magnet examination giving the

indication for expectant treatment led in this case to the most gratifying result.

FOURTH GROUP: **Iron foreign bodies indicated and extracted by large magnet.**

CASE 7.—**Foreign body entering through nasal part of cornea, iris, and lens; led around lens through temporo-inferior part into the pupil; extracted through small corneal section. Perfect and permanent recovery.**

Fr. Liebschik, æt. forty-five, New York. August 10, 1898, while hammering, had the nasal part of his left eye penetrated by a chip of iron. Condition on **admission**, two days later: Corneal wound small, scarcely perceptible; in iris a larger wound. Lens opaque on nasal side. Background illuminable on temporal side; no details discernible. Counts fingers at five feet.

Operation.—The eye holocainized was approached to the large magnet first with the nasal side of the cornea. The patient felt some pain, but no foreign body made its appearance, nor was the iris bulging. Then the point of the magnet was directed toward the outer-lower side of the cornea. A bulge of the iris was at once noticed and with the magnet drawn from the periphery toward the centre, where the foreign body became visible at the margin of the pupil and adhered to the iris. A small downward corneal section was made, the bit of iris to which the foreign body adhered prolapsed, the foreign body was picked up with a small magnet, and the iris reduced. The chip was 3 *mm* long by 2 *mm* broad. August 20th, patient discharged cured, with a round central, movable pupil. Counted fingers at several feet. Later seen several times, cataract had not advanced; on the contrary, it had cleared up. When last seen, March 15, 1899, the opacity was reduced to a well-defined gray stripe running along the periphery of the nasal aspect of the lens. The remainder of the lens was transparent, the vitreous perfectly clear, the fundus as bright as in any eye. $V = \frac{20}{20}$. F and Tn. Pupil round and movable, though the iris was perforated on the nasal side.

This case exemplifies the method which Haab particularly recommends. The foreign body did not retrace the passage of entrance, but showed itself first on the lower-inferior side. As most foreign bodies in the vitreous lie on the lower wall, it is natural that they should first appear on the lower, lower-outer, or lower-inner part.

CASE 8.—**Piece of steel entered eye through larger wound in cornea, iris, and lens. Extracted ten weeks later with magnet, when a corneal incision through an adherent scar had been made. Preservation of form of eye and perception of light.**

Jas. Binny, thirty years, Passaic, N. J. Injury to right eye by a piece of hot steel, November 30, 1898. F normal; V = P L. **Admitted** January 11, 1899. At the junction of the middle and lower thirds an adherent scar. Opaque lens masses fill pupil and part of anterior chamber. No particular inflammation. When eye was moved to magnet up to ½ inch patient experienced a painful sensation as from an electric shock. On further approach he felt a distinct pain and the iris bulged on outer-lower part. When eye was brought in contact with the tip of the magnet the latter on withdrawal would pull the eye a little forward. The patient was put on the operating chair, and an incision was made through the scar in the cornea, through which soft lens substance and a few drops of transparent vitreous escaped. The tip of the small magnet (of Hirschberg) was introduced 2 or 3 *mm* into the anterior chamber, but failed to extract the foreign body. The patient was then put again before the large magnet. When the cornea was about 1 *cm* from the tip the foreign body passed through the wound and flew to the tip, from which it projected like a needle. Recovery without inflammation. Patient discharged Jan. 17, 1899. Perception of light. Field normal. The chip was 6 *mm* long, 3 *mm* broad, 1 *mm* thick.

CASE 9.—**Entrance through cornea and lens. Panophthalmitis in twenty-four hours. Chip removed immediately. Exophthalmus. Chemosis. Lids stitched together. Swelling soon diminished. Lower half of cornea sloughed. Enucleation. Scar in posterior part of sclera. Recovery.**

Rudolph Tiller, æt. nineteen, Jersey City. Piece of steel in right eye from hammering September 5, 1898. Sight not immediately impaired; slept well. Pain next morning. Sight increasingly dim, entirely lost when he **presented** himself in the clinic at 2.30 P.M. Pupil clouded, S = 0. Panophthalmitis.

Operation.—Iris made bulging in lower-outer part. Downward corneal flap section. Iris prolapsed at once. Tip of Hirschberg's magnet introduced into anterior chamber, no result. When the eye was again brought near the tip of the magnet the foreign body suddenly leaped out of the corneal wound and stuck to the tip of the magnet with its long diameter straight forward. A

piece of iris was excised. On gentle pressure the soft lens matter almost entirely escaped. Soon the eye became more and more painful, the lids swelled enormously, marked chemosis, the cornea obscured; the eye was very prominent and scarcely movable; no purulent discharge. The eye had the picture of *orbital thrombosis.* Temp. 100.6° to 101.8°. Pulse 100. Ankle and shoulder joints somewhat painful. Large gland in left popliteal space. The latter symptoms disappeared in three days. The lids were stitched together over the protruding conjunctiva. Swelling soon diminished. Iris yellowish, lower half of cornea sloughed. The eye gradually shrank and on October 8th, thirty-four days after injury, it was **enucleated,** though the other eye was free from irritation. The eyeball, examined immediately after the operation, showed a scar in the posterior part of the sclera, evidently from a previous rupture. Explorations with the finger failed to detect a foreign body or anything else abnormal in the depth of the orbit. The recovery was without disturbance. Discharge October 11th.

This case is very remarkable. The foreign body measured only 5 *mm* by 3 *mm.* It produced panophthalmitis and total blindness in twenty-four hours. The eyeball became prominent, swollen, and stiff. Lids and conjunctiva swollen, rise of temperature, and acceleration of pulse, with slight and transient painfulness in joints. After enucleation a scar was discovered in the posterior part of the sclerotic, evidently produced by a rupture, the consequence of the injury. Blood and exudation probably extended through this rupture into the orbit and produced thrombosis of the orbital veins.

CASE 10.—**Hypopyon; iritis twenty-four hours after injury, checked by extraction of foreign body. Posterior synechiæ detached with forceps. Foreign body with a string of ciliary processes extracted. Hemorrhage. Recovery with somewhat shrunken but quiet eyeball.**

Jas. Parks, æt. forty-eight, New York. On August 31, 1898, while hammering an iron band around a piece of wood, he felt something strike his left eye, impairing sight at once. Some pain at night. Admitted September 1, 1898, 3 P.M., with circumcorneal injection and hypopyon of 3 or 4 *mm* in height. Pupil not dilatable, occupied high brownish-gray material, synechiæ all around, anterior chamber shallow. P L. Projection good. No tenderness on pressure.

Operation, September 1st. Atropine, cocaine; eye moved toward tip of magnet with centre of cornea. When the cornea almost touched the tip of the magnet the lower part of the iris bulged and a small black spot appeared in the hypopyon, which disappeared when the eye was moved away from the magnet. A small downward flap section of the cornea liberated the pus but made no foreign body visible. The small magnet, whose tip was introduced into the anterior chamber, had no effect. The iris was then seized with forceps and torn loose from the lens capsule. The eye was again moved toward the tip of the magnet. At a distance of 5 *mm* the lower part of the iris was seen bulging. On moving the cornea downward, the bulge in the iris moved upward, and when the tip of the magnet was held into the corneal wound, the foreign body, with a string of grayish-black soft tissue, in the head of which it was embedded, jumped to the tip of the magnet. Blood filled the anterior chamber and escaped through the section. The wound was cleansed and a spatula passed through it to stroke iris tissue back. During the whole operation the patient felt no pain. Pressure bandage. Rest in bed.

Moderate reaction, no suppuration. Blood remained in the anterior chamber for two to three weeks. No pain. Discharged September 16th, sixteen days after operation. Seen later, March, 1899. Eye somewhat shrunken, slight diminution of tension, pupil closed, iris lustrous. S $\frac{1}{\infty}$. No irritation. Other eye normal.

I have reported this case in full on account of some important symptoms:—

(*a*) The *chip of iron was* evidently *infected*, for it had produced purulent iritis with circular synechiæ in twenty-four hours. The *removal of the foreign body prevented the inflammation from developing into panophthalmitis.*

(*b*) A chip of iron was drawn by the magnet behind the iris, but could not be led into the pupil on account of the *posterior synechiæ shutting off the passageway.* Instead of making an iridectomy, as is usual in such cases, I succeeded in clearing the channel by making an incision into the cornea, through which I could introduce into the anterior chamber a pair of iris forceps with which the iris was severed from the lens capsule.

(*c*) The *piece of iron* must either primarily have lain in

the ciliary body or have been drawn thither by the magnet, for it *came out with a string of ciliary tissue attached to it.* Among the dangers inherent in the use of powerful magnets, the latter eventuality is considered one of the greatest. We should therefore be careful to avoid entangling the piece of iron in the loose tissue of the ciliary processes by directing the power line of the magnet toward the posterior pole of the lens, whence the foreign body by slow and careful movements of the eye can be led around the lens into the posterior chamber, and thence into the anterior through the pupil. If this road be obstructed, it can be opened by an iridectomy or, as in the above case, by corelysis.

CASE 11.—**Infected chip of iron; purulent irido-choroiditis. Extraction of chip with loss of vitreous. Shape of eye preserved.**

Theo. Costello, æt. thirty-seven, New York. November 28, 1898, while hammering, felt that a chip of iron had struck and entered his right eye, soon causing great pain and loss of sight. **Admitted** December 1, 1898. Infiltrated wound in cornea, vertical, 5 to 6 *mm* in extent. Cornea dull, circumcorneal injection, iris discolored, cataract.

Operation, December 1st. At first large magnet did not indicate a foreign body, but on the second application it made the iris bulge on the nasal side. The foreign body not moving toward the pupil, a horizontal corneal section was made at the junction of the lower and middle thirds. The tip of a Hirschberg magnet, introduced into the pupil, did not attract the foreign body. The large magnet, before which the eye then was held again, extracted the foreign body when the eye was almost in contact with it. Soft lens substance and some vitreous escaped. Irido-cyclitis purulenta. Moderate shrinkage of eyeball. No irritation. Piece of iron 6 *mm* long, 2 *mm* broad, 1-2 *mm* thick. Other eye, Robertson pupil, no atrophy of optic disc, no history of syphilis.

On correcting the proof of this communication I may add two other cases which occurred a few days ago.

CASE 12.—**Piece of iron entered through cornea and lens into vitreous. Extracted by leading it into lower part of posterior chamber. Keratotomy. Extraction with Haab's magnet. Patient doing well.**

Mr. L. Wachtel was brought to the clinic by Dr. Chas. H. May, assistant visiting ophthalmologist to the Mt. Sinai Hospital, New

York, March 29, 1899. A piece of iron had penetrated into the right eye two days previously. The cornea showed a horizontal wound of 3 *mm* in its centre, and the anterior capsule of the lens a corresponding laceration. Lens cataractous. Pupil round, about 4 *mm* in diameter, under atropine. Perception of light and projection good. Foreign body not seen.

Operation.—Holocaine. Eye approached to tip of magnet, trying to draw foreign body out through entrance canal. No result. Then, under the supposition that foreign body, as usual, was lying at bottom of vitreous, the power line of the magnet was directed from the upper half of the cornea to the lower part of the equator of the eye. In a short time, after a few alternate openings and closures of the circuit, the lower part of the iris showed a bulge, but the foreign body could not be drawn into the pupil. When the current was interrupted, the bulge in the iris disappeared without a trace. The patient was then placed on the operating chair, a small section was made in the lower segment of the cornea, and the patient put before the large magnet again. On approaching the eye to the tip of the magnet, the bulge in the lower part of the iris reappeared, a black spot appeared at the edge of the pupil, and on further approach a piece of iron hung at the tip of the magnet. It was 4 *mm* long and 1.75 *mm* wide. The iris, which was slightly prolapsed, was reduced, atropine instilled, the eye bandaged, and the patient put to bed in the hospital.

March 30th.—The patient had insignificant pain during the night. Lens more swollen, iris adherent to wound, not protruding. No pain to-day. No inflammation.

Case 13.—Chip of iron three months in eye. Irido-cyclitis. Sediment at bottom of anterior chamber. In nasal part of iris an indistinct black spot. After keratotomy iron extracted with Haab's magnet.

Mr. A. Rettinger, æt. 16, came to the clinic March 29, 1899, with marked episcleral congestion, dull iris, clouded pupil; in the nasal part of the iris an indistinct black spot was noticed; saw movements of hand, candle only in outer-lower part of field. He had been under treatment in two ophthalmic hospitals, eye becoming steadily worse. He said that in November, 1898, a piece of iron flew in his eye. Great pain. Sight gradually failed.

Operation.—The cocainized eye, approached to the magnet, became painful, and when further approached the black spot was

more conspicuous and advanced toward the surface of the iris. It could neither be drawn up nor forward. A vertical incision of about 5 *mm* was made into the cornea just in front of the foreign body. When the eye was moved to the magnet again, the black spot became more distinct and flew through the incision in the cornea to the tip of the magnet. It measured 5 *mm* by 3 *mm*. Atropine; bandage; bed; April 3d, no reaction; eye clearing.

The construction and use of Haab's magnet are sufficiently known, and, with the incident literature, described in detail by the writer in Norris and Oliver's *System of Diseases of the Eye*, vol. iii., p. 936, Phila., 1898.

In concluding I wish to draw attention to two papers on the subject:

I. EUGEN V. HIPPEL: "Über Netzhaut-Degeneration durch Eisensplitter, nebst Bemerkungen über Magnetextraction," *Von Gräfe's Archiv*, Bd. 42, Abth. 4, S. 151–206, 1896. The first part describes the degenerative changes in eyes harboring iron for a length of time; the second part details eight cases of iron foreign bodies in the eye, from Leber's clinic; one, not giving any indication with the Haab magnet, proved to be a piece of stone. Among the seven remaining cases attempts at extraction with Haab's and Hirschberg's magnets were unsuccessful in five, in one the piece of steel was extracted with Hirschberg's magnet and the patient recovered, though with great impairment of sight; the other, extraction with Haab's magnet, is so remarkable that I beg to quote it in abstract.

Case 6 (*l. c.*, p. 199). Andreas Holzschuh. Injury by splinter of iron. Patient comes to clinic at once. Wound in centre of cornea 3 *mm* long, cataract, foreign body not seen. Introduction of Hirschberg's magnet through the wound canal into the vitreous, unsuccessful. The next day the first application of Haab's magnet unsuccessful. Patient complains of some pain. In the second application severe pain, the foreign body, long and wide, hangs on the magnet. Hemorrhage into the anterior chamber. Smooth recovery, with $V = \frac{6}{18}$. The foreign body was drawn out of the eye by the channel through which it entered, *i. e.*, cornea and lens.

II. DR. SACHS, from Prof. E. FUCHS'S clinic. "Sideroscop und Electromagnet; ihre Verwendung in der Augenheilkunde," *Wiener klin. Wochensch.*, 1898, No. 43, and extract in Hirschberg's *Centralblatt f. pract. Aug.*, 1899, S. 61. The author reports 31 cases, observed during the last two years. In 20 the Haab magnet was applied immediately after the injury, and the patients were discharged with eyes free, or almost free, from inflammation. In 2 cases V was reduced to perception of light. Eight cases came later, on account of inflammatory symptoms, which were removed by the extraction of the foreign body. In 3 cases the successful extraction did not prevent the loss of the eye by subsequent inflammation. Dr. Sachs speaks of the use of the electro-magnet at Fuchs's clinic as follows: Chips of iron were removed with the electro-magnet of Haab either through the entrance canal or, where this was not possible, by leading them into the anterior chamber and extracting them after opening it. Haab's magnet has proved to be of particular service in cases where the piece of iron was in the vitreous. Its use is devoid of the following disadvantages: (1) opening of the vitreous chamber, (2) introduction of an instrument into this cavity, (3) the consequent loss of vitreous, and (4) the danger of infection. The utility of the electro-magnet in detecting the presence of foreign bodies in the eye is dwelt upon. Concurring with all these conditions and having followed the same methods in my own practice, I would not restrict myself to the two ways of applying the electro-magnet, but consider the method of removing iron foreign bodies through a new opening in the sclerotic preferable in particular cases. The prejudicial consequences of drawing iron splinters into the ciliary body are recognized by Haab and exemplified in my own series. The powerful electro-magnet is a new instrument, its advantages are demonstrated and appreciated, but it will require further study to find out all the benefit it is capable of bestowing, eliminate its dangers, and restrict or exclude its use when the smaller magnet, according to Hirschberg's or other models, appears preferable.

RESTORATION OF THE CONJUNCTIVAL CUL-DE-SAC IN A CASE OF TOTAL SYMBLEPHARON, BY MEANS OF THIERSCH SKIN GRAFTS.

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CASES of total symblepharon, in which there has been complete obliteration of the conjunctival cul-de-sac, are generally regarded as incurable. Even where the adhesions between the ocular and palpebral conjunctiva do not completely obliterate the sac, but are yet extensive, the results of operative interference are frequently unsatisfactory, especially if an examination be made some time after the operation. The connective tissue underlying the new lining has a tendency to shrink and as a result there are frequently changes which neutralize or minimize the good effects seen immediately after operation. This explains why so many operative procedures have been proposed, especially for cases of posterior symblepharon.

It is for these reasons that the writer has thought the satisfactory cure of a case of total symblepharon by the insertion of Thiersch grafts worth reporting. The eye operated upon presented complete adhesion between both upper and lower lids and the globe as a result of a burn from lime some years before. The symblepharon was so complete that lids and eyeball were kept in one position; the lids could neither be closed nor opened beyond the space represented by the free portion of the globe. As a result of such

exposure, the surface of the cornea had become dense and tough, resembling skin; it also presented a well-marked staphyloma due to ulceration following the original injury. The completeness of the symblepharon was not merely apparent; upon dissecting the lids from the eyeball during the operation, no traces of mucous membrane could be found in the fornix nor over any other part of the adherent area.

The report is rendered more satisfactory from the fact that the patient has been under observation for almost two years (more than twenty months) after the first operation, and there has been no shrinking nor modification of the good results originally obtained. The first operation resulted in a perfect cul-de-sac for the upper lid and this complete restoration still exists. The patient is able to wear an artificial eye and the object of operation has been secured. In the lower lid, the first operation restored the central half of the fornix; a second and third operation were needed to obliterate strong bands existing at the outer and inner canthi; remains of these bands still exist but do not interfere with the wearing of a prothesis. The lining of the conjunctival surface of the lids and fornices is smooth, soft, of an epidermoid character, but there is no desquamation and but little discharge.

The operation is not a new one, though the writer is unable to find any mention of a similar case in which the symblepharon was total and in which after a period of almost two years, the original successful result was maintained. Hotz[1] advocated the use of Thiersch grafts as a substitute for conjunctiva in extensive symblepharon, in trachomatous shrinkage, for enlarging a contracted conjunctival pocket, and in certain cases of pterygium, and gave an account of a number of operations in which such grafts were successfully employed.

In the writer's case, much of the success was due to the employment of an effective manner of keeping the grafts in place, immovably applied to the dissected and separated surfaces representing the previously obliterated sacs. This was accomplished through the use of a porcelain shell such as forms the basis of artificial eyes. One of these (Messrs.

[1] *Annals of Ophthalmology*, April, 1893.

J. T. and A. H. Davis of 127 E. 15th Street, kindly placed a number at the writer's disposal) was selected from a number made to fit this patient. Two large Thiersch grafts, shaved from the thighs, were applied over this shell, completely covering both surfaces, with the epithelial or free surface of the grafts towards the surfaces of the shell. Then by placing the covered shell in the dissected sacs, the grafts were applied; they were kept in place by stitching together the lids and applying a firm bandage.

The use of such a porcelain shell for the purpose of keeping the grafts in place was suggested by the good results obtained by Dr. Chambers of Jersey City; the latter presented a patient in whom a partial symblepharon had been successfully operated upon in this manner, the grafts being kept in place by an ordinary button covered with gauze, at a meeting of the Ophthalmological Section of the New York Academy of Medicine some two or three years ago. Subsequently Dr. Marple presented two similar examples of successful result by this method in partial symblepharon. In August, 1898, Morton,[1] of Minneapolis, recommended the use of a prothesis after the grafts had been inserted and held in place by a line of sutures, and reported good results in several instances in which he had operated in this manner with the object of restoring the fornix for the retention of an artificial eye.

Regarding the technique of the operation, a few remarks in addition to the details given in the history which follows may be pertinent. The rules which obtain when Thiersch skin grafts are employed in other parts of the body also apply to those upon the eye. The inner part of the arm or thigh answers well for supplying the grafts. The part from which the grafts are taken should be cleansed for a day or two before the operation and then bandaged with sterilized gauze. Just before operating, after cleansing with soap, washing with sterilized water and then with ether, the selected skin is moistened with warm, sterilized salt solution (six tenths of 1 per cent.), and the blade of the razor is also kept wet with this solution. Two broad retractors are used

[1] *The Ophthalmic Record*, August, 1898.

to stretch the skin, and then with a very sharp razor held flat, by means of a see-saw motion, the very thinnest layer of skin is removed, only the epidermis and the tops of the papillæ being desired.

The grafts should be as large as possible and the combined grafts (two or three ought to be sufficient to line both upper and lower lids) should be about half again as extensive as the area to be covered, to allow for shrinkage. The grafts must not be handled; they are transferred from the back of the razor to the porcelain shell and spread out as smoothly as possible with the epithelial surface next to the prothesis; in this way, both surfaces of the shell are covered; a defect may however be allowed over the centre of the inner surface of the shell, corresponding to the cornea. It is important that the margins of the shell be well covered, so that a continuous surface is applied to the deepest part of the fornix. This is insured by applying the grafts so that they cover a part of one surface and then curve over the margin to the other surface of the shell. In one of the operations, the writer attempted to stitch the grafts with catgut passed through openings made in the porcelain shell; but this is unnecessary, consumes time, and thus jeopardizes the life of the graft. Limited success in one of the smaller operations is attributed to this circumstance.

The dissection of the lids from the globe having been completed so that the lids are freely movable and all bleeding of the divided surfaces stopped, the graft-covered shell is put in place, the lids stitched together, and a firm bandage applied; both eyes are included in the bandage.

If everything goes well, the bandage ought to be left undisturbed for five days. If there is severe pain or offensive odor, the bandage must be removed and the outside of the lids inspected. At the end of five days, the stitches are removed from the lids and the latter cleansed; but the shell is left undisturbed, if possible, for several days longer. At the end of eight days the shell may be removed. After this, the eye requires frequent irrigation with warm solution of boric acid; the shell must be returned after each irrigation and a bandage reapplied.

There is considerable swelling, redness, and some pain. The grafts at first look grayish, soft, and somewhat sloughy; but whatever has not been cast off in the discharges will probably take hold and form a satisfactory lining. After a month, the artificial eye can probably be worn.

At the present time, the lining of the lids operated upon presents a smooth, soft surface having the character of moist, delicate skin, but efficiently replacing the mucous membrane. It is whiter and denser than mucous membrane, but there is no desquamation and no more discharge than is met with in most cases in which an artificial eye is worn after enucleation.

In this case, the cornea was staphylomatous and presented a dense, opaque surface; there was barely perception of light. Hence the question of tolerance of the shell was not tested as it would have been with a transparent and healthy cornea. With a normal cornea, frequent examination of the eyeball would be, of course, imperative, and it would be better to have the shell made of transparent glass. The writer has not had, however, any experience with such cases. In the patients already referred to as having been presented at the New York Academy of Medicine, no injury to the cornea resulted from the wearing of the porcelain shell for a period necessary to insure adhesion of the grafts; but these patients had comparatively small symblephara.

The following is a detailed history of the operations which form the basis for the preceding lines:

Gertrude R., age thirteen, was admitted to Mt. Sinai Hospital on May 12, 1897. She gave a history of having had lime thrown into the left eye seven years before. She was under treatment for a time after the accident, but despite interference the lids became adherent to the eyeball, there was considerable inflammation, and after the immediate symptoms had subsided the cornea became clouded and sight was lost.

Examination upon admission: Both upper and lower lids are firmly adherent to the ocular conjunctiva, leaving merely the cornea exposed. The latter is staphylomatous, opaque, dense, and its surface dull and epidermoid. The lids cannot be opened or closed, and no movement of the eyeball is possible. The cornea is perfectly dry. There is barely perception of light.

Operation, May 20, 1897: Ether anæsthesia. Both upper and lower lids were dissected from the eyeball, going down quite deeply so that they were freely movable. The cavities thus formed were tightly packed with cotton so as to arrest hemorrhage. Two Thiersch skin grafts, each about one inch by one inch and a half, were taken from the arm. These were transferred from the razor to a porcelain shell with the epithelial surface next to the shell. They were smoothed out upon the shell in such a manner as to cover the entire shell; the two grafts met at a line corresponding to midway between the margins, so that when in place the margins of grafts would correspond to the edges of the lids. In this way, the margins of the shell were covered with a continuous layer. The bleeding having ceased, the graft-covered shell was put in position, the lids were sutured together with three silk sutures, and a firm bandage applied. Next to the eye, a heavy layer of cotton soaked in solution of boric acid was placed so as to keep the grafts moist. Both eyes were included in the bandage.

May 23.—The patient complaining of pain, the bandage was removed and the surface of the lids inspected. These were reddened and swollen, and there was a moderate amount of rather offensive discharge upon the dressings. Neither stitches nor shell were disturbed. Bandage was reapplied to the left eye.

May 25.—The patient complained of considerable pain. Upon removing the bandage, the lids were found red, very much swollen, and tense. There was considerable offensive discharge upon the dressing. The lid sutures were removed. The shell was not disturbed. Appearance rather unfavorable. Rebandaged.

May 27.—There is less swelling and redness. Considerable offensive discharge upon dressing. The lids were separated gently and the shell removed. The sac was irrigated and the shell reinserted. The grafts have taken hold, but look gray, soft, and sloughy. Eye rebandaged.

June 1.—The eye is irrigated three times each day, the shell removed, cleansed, and reinserted, and the bandage reapplied. Solution of boric acid, warmed, is used for irrigation. The grafts look better and the appearances are more favorable.

June 15.—The same treatment has been continued since last note. The upper lid is entirely free except a slight adhesion at inner canthus; this is loosened daily. The lower lid presents a number of firm adhesions which are also broken up daily.

June 25.—The upper lid is now entirely free. The lower lid

still presents a number of adhesions especially at the canthi. The shell is worn constantly. The eye is irrigated three times a day. A light dressing held on with adhesive plaster takes the place of a bandage.

July 20.—The upper lid is swollen and reddened and there is some pain. The eye is irrigated frequently and iced pads applied.

July 22.—Swelling of upper lid has subsided.

August 22.—Condition the same. There has been, however, more discharge. For this, solution of bichloride, 1 to 6000 was used for a time, and then solution of peroxide of hydrogen. As a result of these applications the discharge has become less in amount.

August 26.—Discharged. Examination on this day shows upper lid entirely free and movable. Lower lid adherent by means of strong bands at inner and at outer canthus. With the exception of these two spots, the grafts have taken hold. There is still a moderate amount of discharge.

September 29.—Readmitted to the hospital. Condition same as at time of last note.

September 30.—**Operation.** Ether anæsthesia. The strong bands at canthi were divided deeply. The shell was covered with Thiersch grafts corresponding to the separated area. The external canthus was divided so that the graft-covered shell could be applied with greater precision. External canthus stitched after shell had been put in place. Lids stitched together and eye bandaged after a moist pad had been applied. Both eyes included in the bandage.

October 3.—Patient complains of pain. Bandage removed and outer surface of lids cleansed. Shell not disturbed. Considerable offensive discharge upon dressing. Both eyes rebandaged.

October 5.—Bandage removed. Fetid discharge. Sutures removed from lids. Part of grafts upon dressing. Considerable redness and swelling. Shell left in place. Rebandaged left eye.

October 8.—Eye rebandaged daily and outer surface of lids cleansed. Considerable discharge. To-day shell was removed. The grafts have taken hold but not over the entire dissected area. Shell reinserted and bandage applied.

October 12.—Shell is causing pain; removed and smaller one inserted. The lower lid is now free except at inner portion where there is a large mass of granulation tissue. The eye is irrigated three times a day, the shell worn constantly and a bandage kept on. Granulations excised.

October 22.—Same as at last note. Discharge is abundant and somewhat offensive. There is still an adhesion at inner canthus.

November 10, 1897.—Discharged. Examination of the eye at time of discharge from the hospital shows the following condition: Upper lid free and well lined with epithelial surface. Lower lid free except at inner canthus. Moderate discharge which is no longer offensive. The shell is kept in place constantly, the eye irrigated several times a day, and a light dressing worn and kept in place with adhesive plaster.

July 5, 1898.—Readmitted to hospital. Upper lid free throughout its entire extent. Lower lid adherent at inner and at outer canthus.

July 7.—**Operation.** Ether anæsthesia. The adhesions of lower lid were divided and grafts placed upon shell and inserted as in former operations, except that catgut sutures were passed through grafts and through holes in shell to keep grafts in place. This consumed considerable time and did not seem to answer any better than in previous operations when this stitching to the shell was omitted.

August 2.—The course after this third operation was similar to that after the second. The result was an improvement. There is still a slight adhesion at the inner canthus and a very delicate one at the outer canthus; but these will not interfere with the proper retention of an artificial eye. Patient was discharged.

September 14.—Readmitted to the hospital for removal of the staphyloma and reduction in size of the eyeball to form a better stump. Condition the same as at last note.

September 15.—**Operation.** Ether anæsthesia. Abscission of staphyloma and evisceration of left eyeball.

September 17.—Grayish patch on inner surface of upper lid. This was caused by pressure of the retractor at time of the operation.

September 20.—Gray patch no longer visible. Shell placed in sac.

October 1.—Patient discharged. Examination at this time shows: Upper lid entirely free and covered with grafts which are soft, smooth, and form an excellent lining surface. Lower lid also lined in same manner. Slight cicatricial bands persist at inner canthus, but these are covered with skin and do not interfere with retention of prothesis. There is but little discharge.

March 17, 1899.—Patient is now wearing an artificial eye and

the cosmetic effect is good. The lining to lids has remained effective. There is the same freedom as existed at last note. There is but little discharge. The eyeball, reduced in size by the last operation, forms a good stump. The inner surface of the upper lid and the fornix are covered by a smooth, continuous layer of skin. The lower lid and lower fornix are lined by skin which is equally efficient but less smooth near inner canthus owing to the existence of slight cicatricial bands in this situation.

THE LAW OF LISTING AND SOME DISPUTED POINTS ABOUT ITS PROOF.

By CARL WEILAND, M.D., Philadelphia.

(*With two figures in the text.*)

IT is a curious fact that Listing's law is so frequently quoted by most authors without their giving a hint as to its source or proof by the experimental evidence, as indeed Listing himself gave no experimental proof of it. There is, further, a great deal of apparent mystery connected with this law and the experiments, because the different authors often give very contrary statements about the explanation of the position of the after-images. Thus on studying Helmholtz and Le Count with reference to this question, years ago, the writer became somewhat bewildered and it was only after he found a new elementary demonstration for the rotation of the after-images according to Listing's law that the whole subject became clear to him. As others may have experienced the same difficulty the writer believes that a publication of this demonstration may be of benefit to others likewise. Another reason for writing this paper is the fact that lately Dr. G. Hay presented his views about this subject at the July meeting, 1898, of the American Ophthalmological Society.[1] The writer agrees on the whole with the statements made there, but it would seem to him that his proof lacks the mathematical precision and simplicity of which this subject is so much in need. For it is not only the general apparent rotation of vertical and hori-

[1] *Transactions American Ophthalmological Society*, vol. viii., p. 414, 1898; published also in the *Annals of Ophthalmology*, vol. vii., p. 545, 1898.

zontal after-images that we want to know, but also the exact amount of these rotations, in order to see whether they are in perfect agreement with Listing's law or not.

First, then, let us state the law of Listing: "*If the visual line is in any way brought from the primary position into any other secondary position, the rotation of the eye in the latter position is such as if the eye had been rotated around a fixed axis which is perpendicular to both the primary and secondary position of the visual line.*" We will now investigate what are the mathematical consequences of this law, accepting it as true for the present. Let us suppose that, as is generally the case in normal eyes, the primary position of the eye is such that the visual line in that position, with head erect, stands at right angles to the wall which is parallel to your face or rather to a vertical plane passing through a line joining the two rotation-centres of the eyes (Fig. 1).

Let in our diagram (Fig. 1) O be the centre of the right eyeball and O A be the visual axis in the primary position, so that the line O A stands perpendicular to the plane of the wall and gives the distance of the centre O in front of the wall, or here the plane of the paper. This plane of the wall or paper is parallel to the vertical plane, that goes through the line joining the two centres of the eyes. The eye may now look up and out at point B, so that the final position of the visual axis is given by the line O B. Listing's law demands that the final position is such as if the eye had rotated around line N P which is peperndicular to both O A and O B. Evidently line N P must be parallel to the plane of the wall, because it is perpendicular to O A, and it must further lie in the vertical plane that can be laid through the centre of the eye in the primary position. We will assume that this plane be fixed in the eye. Let us now draw in this vertical plane of the eye in the primary position the vertical axis R O M and the horizontal axis K O S. Of course as long as the eye is in the primary position these two axes are parallel to the wall as the vertical plane is parallel to the wall; but the moment the eye rotates around the oblique axis N P of Listing, the formerly vertical plane ceases to be vertical and begins to be inclined to the wall,

finally cutting it in a line G H which must be parallel to axis N P. In this final position the perpendicular to the rotating plane is O B, the new visual axis, and N P has remained parallel to the wall. But what has happened to the former vertical and horizontal axes R M and K S? It is evident that, as they lie in the now oblique plane of G R S H, they must cut the wall also and in the line of G H parallel

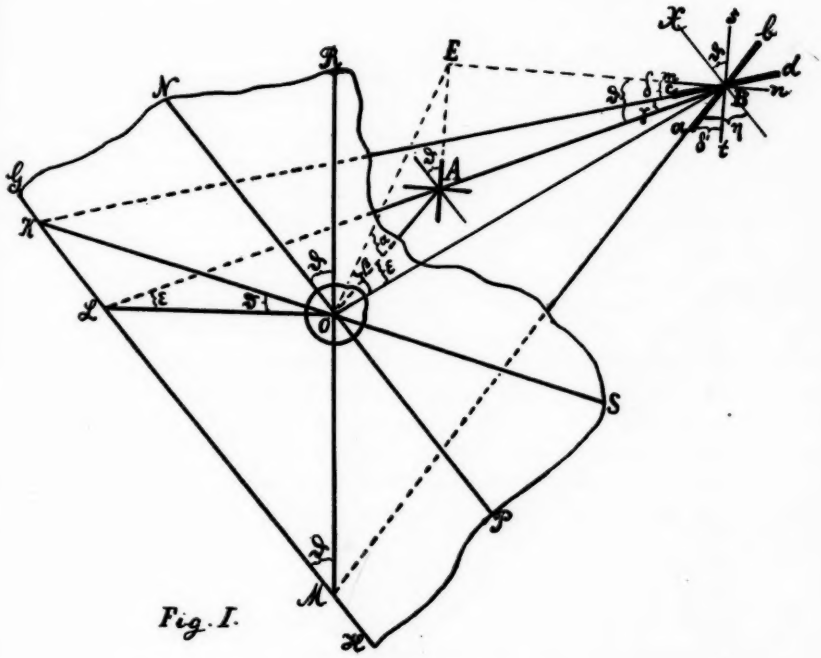

Fig. I.

to N P, because G H is the only line which is now common between the wall and the former vertical plane of the eye. Let the former horizontal axis cut the wall in K and the former vertical axis do so in M of the line G H.

Now we must remember that the vertical and horizontal meridians of the eye, which project the after-images, are exactly parallel to the two axes just mentioned, and that they lie about 12 millimetres behind the centre of rotation O on

the visual line. It is clear, therefore, that a plane going through visual axis and former vertical (or horizontal) axis R M (or K S), must also go through the vertical (or horizontal) meridian of the retina. In other words, the vertical meridian, which carries the after-image of the vertical line in the primary position, lies, after the rotation of the eye around axis N P, in the plane B O M, and the former horizontal meridian of the retina, which carries the after-image of the horizontal line at A, lies in the plane K O B. It is evident, therefore, that the after-image of the vertical line must appear on the wall at point B in the line in which the plane B R M or B O M cuts the wall—that is, in line M B, and that it must be *ab*. For the same reason, the after-image of the horizontal line at A must appear at point B in the line B K, in which plane B K S or B O K intersects the wall; it must be *cd*. So much for the qualitative analysis of the phenomenon.

But now to the more important quantitative consideration. How much is B M or *ab* inclined to the vertical line *st* of the wall, and how many degrees does the after-image of the horizontal line *cd* deviate from the horizontal line *mn* of the wall? Or otherwise expressed, how great are the angles δ and δ' as indicated in the diagram? To find these relations, let us extend a plane through the two visual axes O A and O B, which plane must be perpendicular to line N P, as N P is perpendicular to both O A and O B in this plane. This plane cuts the plane of the wall in line L A B and the oblique plane G R S H in line O L. As line K M is parallel to N P it must be also perpendicular to plane O B L and therefore perpendicular to both the line L B and L O. Therefore the angles K L O and K L B are right angles. If, further, we call ϑ the angle which the oblique axis N P makes with the former vertical axis R M, then, as L O is perpendicular to N O, the angle K O L is also ϑ. Let angle K B L $= \gamma$. Now we have

$$\text{tang. } \gamma = \frac{\text{K L}}{\text{L B}} \text{ and tang. } \vartheta = \frac{\text{K L}}{\text{L O}} \text{ or L B tang. } \gamma = \text{L O tang. } \vartheta$$

$$\text{or } \frac{\text{tang. } \gamma}{\text{tang. } \vartheta} = \frac{\text{L O}}{\text{L B}} \quad \text{(I)}$$

Now L O B is a right-angled triangle, as the visual axis O B stands perpendicular to plane G R S H and therefore perpendicular also to line L O in this plane. Again if we call ε the angle A O B, by which the eye rotated around the oblique axis N P, we observe that angle B L O is also equal to ε, as O A is perpendicular to L B. Therefore

$$\cos \varepsilon = \frac{\text{L O}}{\text{L B}}$$

and we have from (I)

$$\frac{\text{tang. } \gamma}{\text{tang. } \vartheta} = \cos \varepsilon \text{ and tang. } \gamma = \cos \varepsilon \text{ tang. } \vartheta$$

Now the deviation of *cd* from the horizontal line $mn = \delta$, equals $\vartheta - \gamma$, because angle E B A $= \vartheta$, as the reader will see from the diagram. We have now

$$\text{tang. } \delta = \text{tang. } (\vartheta - \gamma) = \frac{\text{tang. } \vartheta - \text{tang. } \gamma}{1 + \text{tang. } \vartheta \text{ tang. } \gamma} = \frac{\text{tang. } \vartheta \, (1 - \cos \varepsilon)}{1 + \cos \varepsilon \text{ tang.}^2 \vartheta}$$

Similarly we find

$$\text{tang. } \eta = \text{tang. L M B} = \frac{\text{L B}}{\text{L M}}$$

We have further in the right-angled triangle L O M, the right angle being O L M, the relation

$$\text{tang. } \vartheta = \frac{\text{L O}}{\text{L M}}$$

This gives

$$\frac{\text{tang. } \eta}{\text{tang. } \vartheta} = \frac{\text{L B}}{\text{L O}}$$

But as

$$\cos \varepsilon = \frac{\text{L O}}{\text{L B}}$$

we have

$$\text{tang. } \eta = \frac{\text{tang. } \vartheta}{\cos \varepsilon}$$

Now angle $\delta' = \eta - \vartheta$, and so we have

$$\text{tang. } \delta' = \text{tang. } (\eta - \vartheta) = \frac{(1 - \cos \varepsilon) \text{ tang. } \vartheta}{\cos \varepsilon + \text{tang.}^2 \vartheta}$$

These two formulæ are in perfect agreement with those given by Helmholtz [1] that were derived by a higher method;

[1] *Phys. Opt.*, second edition, p. 654.

but the writer gives his own proof here because it is simpler and more convincing to a mind less accustomed to the abstract proceedings of analytical geometry. If we measure the excursion of the eye from A to B, not by the two angles ϑ and ε, but in such a manner that the visual axis O A first moves up vertically to point E, which lies with B on the same horizontal line, and afterwards horizontally along line E B to the point B, thus describing successively first the angle A O E $= \alpha$ vertically and then the angle E O B $= \beta$ horizontally, we may introduce these two angles into our formulæ for δ and δ' by considering that

$$\cos\alpha\cos\beta = \cos\varepsilon \text{ and that (because } \sin\alpha = \frac{E\,A}{E\,O} \text{ and tang. } \vartheta = \frac{E\,A}{E\,B} \text{ and}$$

$$\text{tang. } \beta = \frac{E\,B}{E\,O}) \text{ tang. } \vartheta = \frac{\sin\alpha}{\text{tang. } \beta}$$

We thus obtain for the horizontal deviation

$$\text{tang. } \delta = \frac{\sin\alpha\sin\beta\cos\beta\,(1 - \cos\alpha\cos\beta)}{\sin^2\beta + \sin^2\alpha\cos\alpha\cos^2\beta};$$

and for the vertical deviation

$$\text{tang. } \delta' = \frac{\sin\alpha\sin\beta}{\cos\alpha + \cos\beta}.$$

By the help of these two formulæ we are now in a condition to determine for each point of the wall the deviation of vertical and horizontal after-images from the vertical and horizontal lines of the wall. We are thus enabled to see whether Listing's law alone governs the [parallel] movements of the the eyes. For if we find that the deviations of the after-images do not quite agree with those as determined by our formulæ, just given, then Listing's law has not been in force alone, but a rotation of the eye around the visual axis must have occurred also. This rotation around the visual axis is impossible by a rotation of the eye around the oblique axis N P according to Listing's law, because N P is parallel to the wall, and the rotation around it can never be decomposed into a partial rotation around an axis that stands vertical to it. Now what observations have been made here to test this law of Listing? Many authors have reported their experiments, but probably the most reliable are those made by Helm-

holtz on normal eyes, and given in his *Phys. Opt.*, 2d. ed., p. 622. They are represented in the diagram below (Fig. 2).

This figure shows at a glance how the after-images of the rectangular cross look distorted in different regions of the wall. If, for example, the eye, after gazing steadily for a time at the cross at *a*, looked at *n*, a point equally up and out for the right eye, the cross would look as twisted at *n* as the

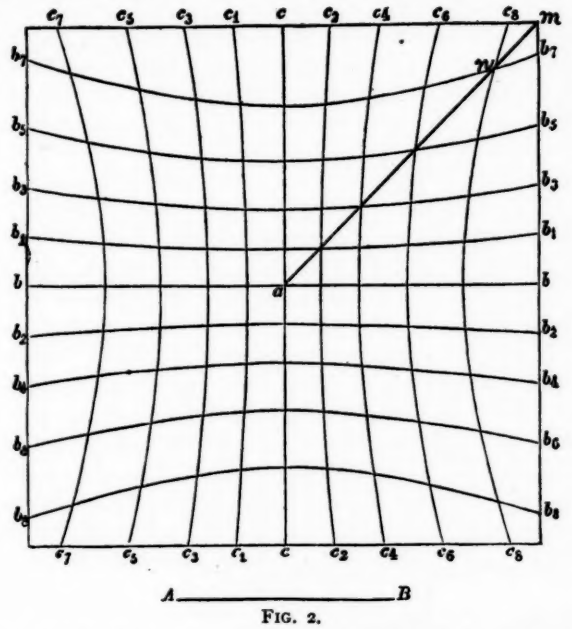

FIG. 2.

two lines b_7 b_7 and c_8 c_8 indicate. We have taken this particular look up and out, because in this case the oblique axis of Listing makes an angle of 45 degrees with the vertical, and our formulæ for the deviations become particularly simple. For as angle $\vartheta = 45°$ we have tang $\vartheta = 1$, and therefore

$$\text{tang}\,\delta = \frac{1 - \cos\varepsilon}{1 + \cos\varepsilon} \quad \text{and tang}\,\delta^1 = \frac{1 - \cos\varepsilon}{1 + \cos\varepsilon}$$

This shows that the horizontal and vertical after-images become equally inclined to the respective lines on the wall.

If, with this knowledge we look at the latter diagram, we find that such is indeed the case; for all along line *am* the horizontal and vertical after-images have the very same deviation from the horizontal and vertical lines of the wall. At point *n* we find, by remembering that the eye was a relative distance equal to line A B off from the wall, that according to our formulæ δ and $\delta^1 = 14^\circ\ 31'$, while by careful plotting we find them to be about 15°. This is the same, because on this small scale the plotting cannot be done accurately enough not to allow of an error of one degree or so. It is thus clear that the normal eyes, from which Helmholtz plotted these curves, move exactly in accordance with the law of Listing—that is, that there is no real rotation of the eye around the antero-posterior axis, but only an apparent one, due to false projection. It must seem very strange, therefore, that Helmholtz in the text would only admit the rotation of the vertical after-image as due to false projection, while from the rotation of the horizontal after-image at *n* he inferred a rotation of the eye towards the *left*. We have shown, however, that by false projection the horizontal after-image must appear rotated also, and that the amount of rotation exactly corresponds to the law of Listing.

A similar objection must be made to Le Conte, who, in his book *Sight*, criticises Helmholtz. He thinks, p. 170, that "the verticals give true results, but the horizontals deceptive results by projection," and he therefore infers for point *n* a rotation of the eye to the *right*. He gives a diagram, similar to Figure 2, in which for each point along line *am* of Figure 2 the verticals are much more inclined than the horizontals. This he explains by arguing that the verticals would be again vertical, and the horizontals would by projection be inclined much more, if not the whole eye had rotated, thus producing the deviation of the verticals and reducing that of the horizontals. But if such were the case there would be a decided discrepancy with the law of Listing; for we have seen that this law demands an equal inclination along line *am*. Nevertheless even Le Conte does not advocate a true rotation around the antero-posterior diameter in the parallel movements of the eyes. The only explana-

tion would seem to the writer to be that Le Conte's eyes, as is also confirmed by other experiments of his, did not quite follow Listing's law, but indulged in a slight rotation outward around the visual axis. It is evident then that in this special case Le Conte had no right to infer and accept Listing's law from his experiments, and it is just this discrepancy between the theory inferred, and the experiments performed, that first confused the writer and must startle the critical reader.

Furthermore, it is shown by Le Conte's exposition and also by that of Dr. Hay, that it is not sufficient to simply explain the peculiar twisted condition of the after-image of the cross, but that it is necessary that we should know the exact amount of the twisting. For it is easily possible that the torsion of the cross on the wall may be in the same direction as demanded by Listing's law, but still may not show the exact amount; in which case a rotation contrary to Listing's law must have occurred. Such deviation indeed occurs during the act of convergence, but it is usually only slight. On the whole, Listing's law describes well the movements of most human eyes, and it is very probable that this law is nothing but another expression of the idea of Wundt, that the eye moves into new positions with the smallest muscular exertion.

REPORT OF THE TRANSACTIONS OF THE SECTION OF OPHTHALMOLOGY AND OTOLOGY AT THE NEW YORK ACADEMY OF MEDICINE.

By Dr. J. HERBERT CLAIBORNE, Secretary.

I.—OPHTHALMOLOGICAL PART OF THE MEETING OF JAN. 16, 1899.

The President, Dr. PETER A. CALLAN, in the Chair.

The evening was devoted to the presentation of clinical material—cases and specimens—and to a paper on muscular asthenopia.

Dr. WALTER B. JOHNSON, of Paterson, N. J., showed a **portable magnet for removing iron foreign bodies from the interior of the eye.** It could be attached to the Edison electric street current. It possessed 140 ohms resistance. He demonstrated its value by attaching it to the electric current in the room. He had not made any quantitative experiments to test its attraction power. Dr. Noyes thought it was a little less powerful than the Haab magnet.

Dr. ARNOLD KNAPP showed a case in which he had operated for **extensive empyema of the frontal and ethmoidal sinuses with exophthalmos according to Jansen's method.** Recovery in four months. Published in full in the January number of these ARCHIVES.

Dr. A. KNAPP also showed a case of **blepharoplasty** operated on eighteen months ago. There had been artificial anophthalmos and cicatricial ectropion of the lower lid. A skin flap was taken from the temple and transplanted according to Fricke's method. The result was excellent cosmetically, and permitted the wearing of a prothesis.

Dr. A. E. DAVIS showed a case of **blepharoplasty for epi-**

thelioma of each lid of the left eye. A sliding flap was brought from the temple and split at its tongue so as to make two lids. The patient also had a keratitis which remained to some extent. The patient was an old man, and remained under ether for three hours.

Dr. RUDOLPH DENIG showed a case of **varicose veins of the orbit.** He referred to a similar case published by Dr. Gruening. Sometimes the varix is found behind the ball, sometimes above, and finally, on either side. His patient showed varices in other parts of the body. The varix here was above, just below the orbital ridge, and was about the size of an olive, soft (no bruit, no pulsation), and slightly increased in size on lowering the head, producing moderate enophthalmos. No heart lesion was found.

Dr. S. M. PAYNE showed a case of an **artery projecting into the vitreous humor.** It seemed to stop short of the posterior surface of the lens. It was quite dark at its apex and floated about with the movements of the eye. It turned upon itself, ran back to the disc. At first he thought it was a remnant of the fœtal hyaloid artery. It occurred in a young girl.

Dr. WILBUR B. MARPLE showed a case of **Thiersch graft in the lower conjunctival sac** of left eye of a man fifty years old. The result was excellent. Operation was done on account of symblepharon.

Dr. E. S. THOMPSON showed a specimen of a **leukosarcoma** in gelatine. A surgeon who saw the case made a diagnosis of detachment; five months afterward the diagnosis was properly made and the eye removed. It was found to be a round-cell sarcoma with large nuclei and occasional spindle-cells.

In the *discussion* which followed the demonstration of these cases, Dr. NOYES said he had observed that skin flaps often became thickened and apparently lardaceous after plastic operations, but had not observed this in Dr. A. Knapp's case. He thought this to be unusual and fortunate and wished to know the experience of others in this matter. Dr. GRUENING said he had observed the same thing. Dr. NOYES remarked that he had noticed it in people under twenty years of age particularly. Dr. H. Knapp had seen the same thing, especially in the lower lids, and suggested slicing out the lardaceous hyperplastic material.

Dr. HENRY D. NOYES presented a paper on **muscular insufficiency** which he did not read in full. He selected several cases, the histories of which he read, as illustrations of the vagaries of

muscular asthenopia. He desired merely to give the Society his general impressions on the subject. He laid considerable stress on the necessity of repeated examinations to make an accurate diagnosis in each case. He said he had been silent on this subject for twelve years, but that at some future time he intended to publish conclusions drawn from several thousand cases. His remarks and conclusions on the occasion he intended to restrict to the horizontal group of muscles, ignoring entirely for the present the vertical and oblique groups. He said the majority of those present doubtless were aware of his views on the advantages of operating in certain cases of muscular asthenopia, and he wished to say that he was no less enthusiastic now in regard to this method of treatment, but at the same time he recognized that there were many cases in which nothing was of service, neither prisms, muscular exercise, nor operation. He believed that many of those cases had an hysterical and a moral side to them, and that several times he had seen cases finally recover only by the apparent exercise of moral strength in the individual. Such cases, in his opinion, had some of the color of faith cure.

He wished it, however, distinctly understood that he was a firm believer in, and advocate of, operating in many cases, and believed that this, and this alone, at times could relieve the symptoms. He called attention to the fact that Graefe was the first to study this subject, particularly in connection with myopia. His own experience dated back as far as 1865. He cited one or two cases illustrating the value of the use of prisms, and emphasizing the necessity of properly correcting all refractive errors before taking up the consideration of the muscular system. He referred to the great value of cocaine as a means of producing anæsthesia, enabling us thereby to examine the condition of the muscles during and immediately after the operation, and that these advantages had too often proved a temptation to unnecessary operations. He finds, however, that to-day he is more cautious and conservative in operating than he was formerly. He does not believe it possible to do a so-called "graduated tenotomy," and in the matter of advancement, he thinks great care should be taken. He thought it a matter of much regret that we do not have the chance to examine normal cases, that those people who consult an oculist have something the matter with them. Nevertheless, there are many with abnormal muscle balance who present no symptom of muscular asthenopia. He cited a case

in which there was for near work adduction power 20° and abduction 15° ; nevertheless, patient had no asthenopia. He worked all day in comfort. He merely found it disagreeable to look at passing objects out of a car window. Conclusions: no symptoms, no treatment. A lady, a patient of his, who had no asthenopic symptoms, but carried her head up and to the left, consulted him. He found 15° of vertical deviation. She had good health and did a great deal of work with her eyes. On examination, he found she had no stereoscopic vision ; she had one-eyed vision. Conclusions: no treatment. Cited another case of a lady who had been operated on repeatedly, prisms and exercise had been tried, and without relief. She finally concluded that she was not doing her duty to herself by thinking so much about her trouble, made up her mind to get well, and did so. Dr. Noyes said this looked like faith cure.

He cited yet another case of a young man with violent symptoms of muscular asthenopia who was unrelieved by any measure, even tenotomies, which were rather hurtful. He was a clerk at Hampton, Va., and later a theological student. As soon as he graduated and was ordained, he commenced to improve, and finally recovered entirely from his asthenopia and picked up in weight, with no other measures than the correction of his refractive error and the use of prisms. Dr. Noyes cited a number of other similar cases. In concluding, he said that while he believed in tenotomy firmly in many cases, he nevertheless thought that the nature of every case, the personal surroundings and conditions and manner of life should be studied, and he called attention to the fact that these cases were found chiefly among the more intelligent classes of people, both those to whom near eye work is a luxury and occupation and among another large class of workers who, for their livelihood, need strong and capable visual apparatus.

In the discussion that followed Dr. Noyes's paper, Dr. GRUENING having been called upon to open the discussion, said that he was somewhat embarrassed in the discussion because, in the first place, he had not had any clear idea of the limit and scope of the paper beforehand, and in the second, because Dr. Noyes did so many things in the treatment of muscular asthenopia that he (Dr. Gruening) did not do. He found all the conditions that Dr. Noyes found, but rarely gave prisms, and rarely did tenotomies, in insufficiency. He did not think that the cases Dr.

Noyes had cited had borne out the claims he made in his prologue for the beneficial effects of operative treatment.

Dr. DUANE laid special stress upon the necessity of care in the diagnosis. All the factors that entered into a case should be got at, and the force of each in producing the deviation and the symptoms ascertained. This seemed a truism, but really was not, for it was habitually neglected, and this neglect was the cause of many disappointments.

In consideration of the variable character that such cases often displayed, he preferred to examine his cases repeatedly ; would not think of making a final diagnosis upon the strength of one examination, and certainly would not think, in any ordinary case, of doing an operation until it had been under observation and treatment for a month or more.

He quite agreed with Dr. Noyes that very considerable deviation might exist without causing symptoms or requiring treatment, and cited a case in which there was a hyperphoria of 8 with habitual binocular fixation, but in which, in spite of the enormous effort that this implied (an effort much greater than if there had been no attempt at binocular fixation), there were no symptoms of any account.

As regarded treatment, he supposed that all were agreed that the first and most important step to take was to correct the refraction. He personally regarded the determination of the refraction *under full mydriasis* as a most important part of the diagnosis, and always made a thorough trial of what correction of the refraction would accomplish before advocating other measures.

In many cases this alone would effect all that was required. In a certain number of other cases, particularly in neurasthenics, general treatment, tonics, change of air, etc., were necessary. In a few cases, mainly those of convergence-insufficiency, exercise with prisms was beneficial. As regarded prisms for constant wear, he considered their use in exophoria and esophoria as, in general, prejudicial, since they had in his experience a marked tendency to increase the deviation. He had seen a divergent strabismus develop out of a trifling exophoria by the use of prisms base in. For hyperphoria of the concomitant variety and not of very high degree, he had found prisms for constant use well borne and serviceable.

Finally, as regarded operations, he resorted to them only when other means had failed, and when, by a process of exclusion, he

was convinced that the symptoms were due to the muscular condition. Here, again, he thought disappointment arose from wrongly directed operations. The principle that he advocated was to *strengthen* weak muscles or reinforce weak action, and to *weaken* overstrong muscles or overstrong actions; doing an advancement in the former case and a tenotomy in the latter. Thus, in an exophoria due to a convergence-insufficiency (and several of the cases cited by Dr. Noyes appeared to be of this character), he would do advancement of the interni rather than tenotomy of the externi; whereas in exophoria due to excess of divergent action, tenotomy of the externi was indicated. Similarly, in esophoria due to convergence-excess, tenotomy of the interni would be the appropriate operation, while in esophoria due to insufficiency of divergence—and this variety was the cause of some of the most troublesome symptoms—he regarded advancement of the externi as the proper procedure.

In conclusion, he would say that he was not so pessimistic about these cases as Dr. Noyes had appeared to be. After deducting the cases which required no treatment and those in which correction of the refraction, tonics, and the use of prisms relieved the symptoms, there still remained a respectable proportion in which operation was indicated and in which the results of the operation were distinctly satisfactory.

Dr. H. KNAPP called attention to the fact that asthenopia diminishes with age. He thought Dr. Noyes's cases, as cited, showed this. He was accustomed to treat these cases in all the ways mentioned. He cited a case of insufficiency of the external recti in which he advised tenotomy of the interni, in the year 1870. The patient consulted Donders, who advised against it. The patient subsequently recovered without operation. He detailed the history of a lady patient of his who, in spite of two tenotomies, had preserved her asthenopia and esophoria, but ultimately recovered. The neurotic element in these cases should not be forgotten.

Dr. KNAPP said that in hyperopic esophoria he used only correcting glasses, as described by Dr. S. M. Payne.

The relief that so often comes with age is an argument in favor of + glasses.

Dr. NOYES closed the discussion. He said he had not yet given out the results of the cases that had terminated happily, but that he would do so at some future time. He did not agree with Dr.

Gruening, and cited one or two cases in which tenotomy did good.

On motion the meeting adjourned.

II.—MEETING OF FEBRUARY 20, 1899.

Dr. PETER A. CALLAN in the Chair.

Dr. H. KNAPP presented a **case of purulent cyclitis.** The patient was twenty-five years old, and at the age of five had had scarlet fever. One eye was inflamed with the result that a small ciliary staphyloma occurred at the nasal margin of the cornea. No further trouble resulted, and the patient had good sight until November 7, 1898, when the eyeball became very red and painful. On November 9th he consulted Dr. Knapp, who found yellowish infiltration of the protrusion and the pupil drawn to the nasal side. The iris was greenish-red, and the pupil responsive to light. There was a deposit on the anterior capsule, and the anterior chamber was deep; no reflex from the fundus, and the tension was T—1. V movements of the hand. The patient was admitted to the hospital and was treated antiphlogistically. Pupil dilated under atropine, and the reflex from the fundus was yellow. With oblique illumination a yellowish-white deposit was seen on the ciliary body all around. The eyeball enlarged greatly; the sclera felt very soft; the inflammation gradually subsided and the staphyloma flattened. In fact all irritation disappeared, and the eye gradually became smaller than the other. The yellowish-white deposit had remained and was easily seen. There was no vision, but irritation was entirely absent. Dr. Knapp said that, as cases of purulent choroido-cyclitis have no tendency to cause sympathetic ophthalmia, he had not advised the patient to have the eye removed, yet he cautioned him to keep his eye under observation.

Dr. H. KNAPP also showed a **case of cholesterinic degeneration of an eye from which a chip of steel had been extracted with a magnet ten years before.** The patient came to him two hours after a piece of steel from a chisel had entered the eye. A wound of 5 *mm* was found in the cornea. The anterior chamber was filled with blood, and there was faint perception of light. The next day a faint reflex from the fundus was seen. Three days later the anterior chamber was clear, but the foreign body was not visible in it, and the vitreous was cloudy.

Operation: meridional incision of the sclera between external and inferior recti. The foreign body was brought out on the fifth introduction of the electrode of Hirschberg's magnet. The wound was closed by conjunctival sutures. Bandage; no reaction. The next day he counted fingers at ten feet. Soon after this there was hemorrhage into the vitreous and the vision fell to seeing the movements of the hand. Nevertheless he had no discomfort for ten years. During the last four months the eye has been red and tender and the upper lid drooped; of late he has felt better again. On the occasion of the presentation the eye was red and full of cholesterine crystals, which formed a solid deposit 3 *mm* deep at the bottom of the anterior chamber, and were suspended in the anterior and vitreous chambers. T—1.

In the *discussion* that followed the narration of these cases Dr. WEEKS said he considered the first case of special interest, as belonging to the category of cystoid scars and incarcerated iris. He had operated on a case of cataract with the result of having an incarceration of the capsule in the wound. The anterior chamber was empty, but it closed later and a cystoid scar formed. The V $\frac{20}{30}$. Two years afterward the cystoid scar ruptured; twenty-four hours later he saw the patient, and twenty-four hours after this there was plastic exudation in the anterior chamber, blocking the pupil. He gave mercury and potassium iodide. In ten days the vision had returned to $\frac{20}{30}$ and the patient went home, the cystoid scar having disappeared. He would be inclined to close these scars well.

Dr. W. E. LAMBERT presented a **case in which he had relieved a very acute attack of glaucoma, resulting from an extensive incarceration of the iris, by making an anterior sclerotomy,** using a Graefe knife. In making the section upwards he cut into the free margin of the iris on both sides, making practically a double iridotomy, and thus relieving the traction on the iris and ciliary body which seemed to be the cause of the glaucoma. The case originally was one of prolapse of the iris with fistula of the cornea, following a large perforating ulcer which had been cauterized. About six months after the cauterization, during which time the eye had been quiet, the glaucomatous attack supervened. The vision had been reduced to counting fingers; it was now $\frac{20}{70}$.

Dr. J. E. WEEKS demonstrated a **case of partial atrophy of the optic nerves due to prolonged uterine hemorrhage.**

The patient, thirty-eight years old, aborted in March; began to lose blood from the uterus May 10th; the bleeding continued almost without intermission for five weeks and five days. Vision began to fail at the end of the third week of the hemorrhage, and the patient became "blind" in one week. Three weeks after the bleeding ceased, the vision was $\frac{1}{200}$ in the right eye and $\frac{4}{200}$ in the left. Good nourishment and tonic treatment have since been given, but vision has diminished and now is $\frac{1}{200}$ in the right eye and $\frac{1}{200}$ in the left. Central fixation is abolished and the fields of vision are much contracted.

Dr. J. H. CLAIBORNE showed a case of **operation for symblepharon.** A boy of nineteen had got lime into his right eye six weeks before, with the result that the lower cul-de-sac was practically entirely eliminated. The patient saw double in all directions except straight to the front and below.

Three suggestions presented themselves—the Thiersch graft, transplantation of rabbit's conjunctiva, and the procedure which was employed. Dr. Claiborne divided the symblepharon completely, rendering the lower lid perfectly free, deepening the cul-de-sac to its normal limit. Two strips of conjunctiva, parallelogram in shape, were dissected up over external and internal recti, so that each free end could be pulled down toward the median line and united by two sutures. This brought raw surface of the conjunctiva opposite the raw surface of the globe below, and presented to the raw inner surface of the lower lid the epithelial surface of the joined flaps. The joined flaps were then stitched to the lower lid by a double suture, transfixing the entire lid, and coming out on the skin side. These sutures were then tied. There was considerable lapping of the flaps over the cornea, toward the inner side particularly. Two weeks had elapsed since the operation. The cul-de-sac was much deeper, the patient far more comfortable, and there was no diplopia in any direction. Dr. Claiborne said that, while the operation had been moderately successful, he did not consider the result as good as he wished or as good as he thought might have been obtained by either the Thiersch graft or the transplantation of rabbit's conjunctiva. This case, as well as his past experience, had taught him that the Thiersch graft or the transplantation of rabbit's conjunctiva were the proper procedures in handling this class of cases, which at best he thought were difficult to deal with.

Dr. CLAIBORNE also presented a case of a woman of forty-eight

years, who had been **struck** on the lower lid of the right eye **by a buck-shot from a toy rifle.** Hemorrhage in the anterior chamber and irido-dialysis, but no fundus changes were present.

Dr. CLAIBORNE also presented **a specimen of melano-sarcoma** of the choroid in a young lady of twenty-eight years. She had noticed some indefinite trouble with her eye for six months. Latterly she had commenced to have photopsies and phosphenes. No pain at any time. She concluded she needed glasses, as she had always been very myopic. She placed her hand accidentally over the right eye in order to test her vision, when she observed for the first time that she could see all objects in the lower part of the field but not in the upper. There was a large blur there. She went to an optician who sent her to an eye surgeon. He diagnosed malignant tumor and advised enucleation. Dr. Claiborne saw the case afterward and on examination diagnosed leuko-sarcoma of the choroid on account of the white appearance of the tumor. The tumor appeared to be about the size of a small filbert, and was situated below—apparently quite near to the ciliary region. It was distinctly yellowish-white by reflected light, and several small coteries of blood-vessels were seen on it. To the right the retina could be seen slightly detached. Immediately enucleation was suggested, and the eye was removed in three days. The recovery was uneventful, and an excellent stump resulted.

Subsequently Dr. A. T. MITCHELL, the former House Surgeon of the New Amsterdam Eye and Ear Hospital, examined the eye and found the tumor to be a melano-sarcoma.

Dr. WARD A. HOLDEN read a paper on the **pathology of the amblyopia following profuse hemorrhage and of that following the ingestion of wood alcohol, as determined experimentally** (published in extenso at the beginning of this number).

In the *discussion* which followed Dr. Holden's paper Dr. WEEKS referred to the experiments of Kussmaul and Tenner in 1857, in which they produced anæmia of the spinal cord by ligating the abdominal aorta, causing paraplegia. Also to the experiments of Ballet and A. Dutil (*La Semaine Méd.*, 1897, p. 346), who produced transient anæmia of the cord by pressure on the abdominal aorta of the guinea-pig, causing transient paraplegia in pressures of five minutes, and permanent paraplegia when pressure was prolonged. Afterward the neurons of the cord were examined and showed degeneration, the chromatophil disappearing first, the

spongioplasm next, and the nucleus last. The anæmic conditions brought about in the cord by the experiments of Ballet and Dutil are analogous to those produced in the retina by pressure on the globe (vision temporarily abolished), mild or profound quinine anæmia, transient or permanent blocking of the arteria retinæ centralis, and anæmia from loss of blood. In connection with the study of the changes in the retinal neurons as a result of anæmia, the very important question of prognosis forces itself upon us. The experiments of Ballet and Dutil go to prove that if the destruction of the neuron does not extend to the spongioplasm, but only affects the chromatophil, the neuron may recover—anæmia of twenty or thirty minutes or perhaps longer. In conditions producing anæmia of the retina we may consider the prognosis to be very bad, so far as the return of vision is concerned, if the anæmia does not pass in from three to twelve hours at the most.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE THIRD QUARTER OF THE YEAR 1898.

By Dr. ST. BERNHEIMER, in Vienna; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Prof. P. SILEX, in Berlin;

WITH THE ASSISTANCE OF

Dr. G. Abelsdorff, Berlin; Dr. Swan M. Burnett, Washington; Dr. Dalén, Stockholm; Dr. Herrnheiser, Prague; Prof. Hirschmann, Charkow; Dr. Krahnstöver, Rome; Dr. P. von Mittelstädt, Metz; Prof. Da Gama Pinto, Lisbon; Dr. Richard Schweigger, Berlin; Dr. Sulzer, Paris; Dr. L. Werner, London; Dr. C. H. A. Westhoff, Amsterdam; and others.

Translated by Dr. Ward A. Holden.

Sections I.–III. Reviewed by Prof. HORSTMANN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

301. Snellen. Thirty-ninth annual report of the Utrecht Eye Hospital, 1897.

302. Gunning. The institution for eye patients in Amsterdam. Report for 1897.

303. Westhoff. The charity polyclinic in Amsterdam. Report for 1897.

Snellen (301) treated 6513 patients and made 638 operations, 69 for cataract.

Gunning (302) saw 11,267 patients and made 271 operations, 31 for cataract.

WESTHOFF (303) saw, in 1897, 1600 patients, 234 having trachoma, and he made 12 cataract operations.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

304. DALÉN. Experimental investigations on disinfection of the conjunctival sac. *Reports from the eye clinic of the Medico-Surgical Institute in Stockholm*, Jan., 1898.

305. BULLOT. On the degeneration of corneal epithelium after enucleation. *Ann. d'ocul.*, cxx., p. 46.

306. HERTEL. On the effects of cutting the optic nerve in young animals. *Graefe's Archiv*, xlvi., 2, p. 277.

307. STÖWER. On the histology of the healing process in wounds of the sclera. *Graefe's Archiv*, xlvi., 1, p. 65.

308. CAMPOS. A note on the variations in the diameter of the pupil after ligation of the internal jugular vein. *Arch. d'opht.*, xviii., 7, p. 454.

309. BONDI. Two unusual cases of congenital megalophthalmus. *Wiener med. Presse*, 1898, No. 26.

310. BULLOT. A cyclopic eye. *Ann. d'ocul.*, cxx., p. 43.

311. VAN DUYSE. The pathogenesis of cyclopia. *Arch. d'opht.*, xviii., 8, 9, pp. 451, 581.

312. SCHMIDT. On the detection of copper in the tissues of the eye after copper foreign bodies have remained in the interior. *Graefe's Archiv*, xlvi., 3, p. 665.

313. VALLERT. On a case of injury with a zinc foreign body, with pathological investigations on the action of zinc in rabbits' eyes. *Ibid.*, p. 656.

314. VAN DEN BERGH. Theory of skiascopy. *Ann. d'ocul.*, cxx., p. 40.

315. DE FALCO. A new theory of the shadow in skiascopy. *Giorn. med. del R. esercito*, 1898, 6–9.

316. WEISS. On the discovery of foreign bodies in the interior of the eye by means of the Roentgen rays. *Ophth. Klinik*, 1898, 5, p. 88.

317. WEISS. Further reports on the use of Roentgen rays in cases of foreign body. *Zehender's klin. Monatsbl.*, xxxvi., p. 350.

318. HAMBURGER. A contribution to the manometry of the eye. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 257.

319. TSCHIRIKOW. On disinfection of the hands of the operator and his assistants. *Wratsch*, 1898, No. 35.

320. KRASSOWSKY. The effects of washing out the anterior chamber in the course of infected wounds of the anterior segment of the eye. *Inaug. Dissert.*, St. Petersburg, 1898.

321. BORTHEN. On the open-wound treatment of cataract patients. *Zehender's klin. Monatsbl.*, xxxvi., p. 280.

322. HJORT. On the open-wound treatment after eye operations. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 296.

323. SYKLOSSI. Subconjunctival injections of sublimate in the treatment of blennorrhœic conjunctivitis. *Ann. d'ocul.*, cxx., p. 1.

324. DE WECKER. The serum therapy in ophthalmology. *Clin. Ophth.*, 1898, No. 11.

325. KNIES. On disturbance of color perception caused by santonin in persons with normal and abnormal color perception. *Arch. f. Augenheilk.*, xxxvii., 4, p. 351.

326. WESTCOTT. An additional case of double congenital microphthalmus. *Jour. Am. Med. Assoc.*, Sept. 24, 1898.

In order to compare the effect of antiseptic cleansing of the conjunctival sac with aseptic cleansing, according to DALÉN (304), various investigators have determined the quantity of micro-organisms in the conjunctival sac before and after antiseptic disinfection, with very different results, owing to various sources of error. In order to avoid error as much as possible, Dalén compared the two eyes of the same individual, with normal eyes. One conjunctival sac was cleansed with sublimate, 1:5000, and the other with physiological salt solution. Both had an equal effect in diminishing the quantity of micro-organisms when the eyes were bandaged for 5–6 hours, but after the use of either, the quantity of micro-organisms was often increased when the eyes were bandaged for 12–24 hours. Other investigations made by the author were on the effect of bandaging on the micro-organisms in the sac, and the effect of iodoform. The micro-organisms most frequently found were the xerosis bacillus and the white pus coccus. DALÉN.

BULLOT (305) removed some of the corneal epithelium of rabbits, and then, after enucleating the eye, introduced it into the abdominal cavity of the animal. The corneal epithelium retained its vitality for several months, and regeneration proceeded exactly

as it did when the eye was not enucleated. Leaving the enucleated eye for 7 hours in the air, or for 4 hours in warm physiological salt solution, did not impair the power of regeneration after introduction into the abdominal cavity. Putting the ball into hydrant water for 4 hours, or into boiled salt solution, or exposing it to hydrogen after washing in physiological salt solution, or leaving it for 4 hours in 1 % morphine solution, prevented the regeneration of the epithelium. A 2 % solution of morphine kills the epithelium, and it is cast off after the eye is introduced into the abdominal cavity. SULZER.

HERTEL (306) cut the optic nerves of a number of young rabbits, carefully avoiding the retinal and the ciliary vessels. Following section of the nerve, the fibres in the bulbar stump and in the retina disappeared. Very gradually an atrophy of the ganglion cells took place. The nuclear layers were still normal after the lapse of a year, but the rods and cones showed degenerative changes after six months. In the central segment of the nerve, the atrophy advanced quickly to the chiasm, but beyond the chiasm its progress was slower. These eyes with the cut optic nerve still grew somewhat, but not so much as the unoperated eyes.

Making a number of experiments on rabbits' eyes, STÖWER (307) finds that the healing process in wounds of the sclera takes place principally from the episclera and from the choroid. The more a wound in the sclera gapes, the less likelihood is there of the formation of a sufficiently resistant scar. A prolapse of the choroid, or the turning in of conjunctiva or muscle, favors the later development of ectasia, as does also increased tension during the healing process. In cases of fresh scleral injury, any prolapse must be excised and the conjunctiva sutured.

CAMPOS (308) cut the cervical sympathetic, after which the 7 *mm* pupil contracted at once to 5 *mm*. Ligating then the internal jugular, the pupil contracted 2 *mm* more. Excitation of the upper end of the sympathetic caused a dilatation of 5 *mm*.
v. MITTELSTÄDT.

BONDI (309) describes two cases in which the eyes were abnormally large. There was no pathological change, but a congenital anomaly of ocular growth, without congenital changes elsewhere in the body. All parts of the eye were enlarged, but there was no disturbance of function.

BULLOT (310) demonstrated a cyclopic eye, having a cornea

larger than the cornea of a normal child. The pupil is double, and each side has a coloboma corresponding to a coloboma of the choroid, which ends at the optic disc. There are two lenses, and a single retina arising from the rudimentary optic nerve which consists of a union of the two primary optic nerves. SULZER.

VAN DUYSE (311), in the part of his paper which has appeared, represents, by numerous drawings, the findings in 9 cases of cyclopia, in order to show at what place the union of the two ocular protons occurs in producing a cyclopic eye. It appears that the junction occurs always, to a greater or less extent, at the contiguous retinal clefts. In every case, therefore, at the place of union, were colobomas of the choroid, retina, and nerve sheath. (Conclusion to follow.) v. MITTELSTÄDT.

SCHMIDT (312) had the opportunity of examining an eye injured by a gun-cap. He found that copper had been diffused in solution throughout the eye. Ferrocyanide of potassium and hydrochloric acid gave in sections of the eye a marked copper reaction, more intense near the seat of the foreign body.

VALLERT (313) introduced particles of zinc into the interior of the eye and found that an inflammatory exudation was formed about the foreign body; the vitreous became denser, and there was retinitis, with or without detachment. In phlogogenic effect zinc stands between silver and lead, but nearer lead.

The theory of skiascopy shows how dangerous it is to present optical problems in description rather than by the algebraic formula or the geometrical demonstration. VAN DEN BERGH (314) points out the error to which this has led. He calls "unit of rapidity" (of the shadow movement) the breadth of the patient's pupil through which the shadow moves in a "unit of time." This definition allows him to express geometrically the relative rapidity of shadow movement, which he does with diagrams.

SULZER.

WEISS (316) reports two cases in which the presence of a foreign body was determined by means of the Roentgen rays.

HAMBURGER (318) was able to show with a new manometer devised by him that absolutely the same tension exists in the anterior chamber and in the vitreous of rabbits, and that marked changes in tension in one chamber were almost immediately equalized.

A series of experiments led TSCHIRIKOW (319) to the following conclusions: The most careful mechanical cleansing of the

hands and washing with green soap and hot water for ten minutes did not entirely free the hands from micro-organisms. Dipping the hands in formol 5 %, permanganate of potassium 5 %, or sublimate 2 %, after mechanical cleansing, also did not render them sterile. Scrubbing the hands for three minutes with alcohol 50–95 % made the hands quite sterile. HIRSCHMANN.

KRASSOWSKY (320) injected staphylococcus cultures into the eyes of a number of rabbits and then performed paracentesis, iridectomy, or extraction. The anterior chamber of one eye of each animal was then syringed with physiological salt solution while the other eye was left for control. The results were as follows:

1. Syringing after extraction did not free the anterior chamber from the cocci, but these remained in the lens matter and the eyes were lost from panophthalmitis. After iridectomy, syringing reduced the violence of the succeeding inflammation to a mild iritis while iridocyclitis developed in the control eye.

2. In simple section of the cornea the micro-organisms were mostly removed by syringing and but slight inflammatory signs appeared. HIRSCHMANN.

SYKLOSSI (323) made 158 subconjunctival injections of sublimate in 83 eyes with gonorrhœal conjunctivitis with very favorable effects on the corneal complications. SULZER.

According to KNIES (325), santonin affects only the cones of the retina which, previously hyperæsthetic to violet light, then became anæsthetic to this light.

In WESTCOTT'S (326) case the orbit and lids were normal, but the eyeballs were much below the normal size. The corneæ were opaque at the centre and shaded gradually off into the sclera, leaving a clear ring between. Iris was faintly visible through cornea but the pupil could not be clearly made out. There was some vision present, for the child could get about after a fashion. BURNETT.

III.—INSTRUMENTS AND REMEDIES.

327. DALÉN. On holocain and its effect upon corneal epithelium and on the healing of corneal sections. *Nord. med. Archiv*, 1898, No. 16.

328. WICHERKIEWICZ. On the absorbent action of iodide of potassium after cataract operations. *Wochenschr. f. Therap. u. Hyg. d. Auges*, 1898, No. 49.

329. ANTONELLI. On the recent model of the Javal-Schiötz ophthalmometer. *Ann. d'ocul.*, 1898, 1, 2.

330. OSSWALT. On periscopic glasses. *Graefe's Archiv*, xlvi., 2, p. 384.

331. EBNER. A portable apparatus for illuminating transparent text types and for ophthalmoscopic purposes, with remarks on the testing of acuteness of vision. *Münch. med. Wochenschr.*, 1898, No. 39.

332. KNIES. The chromatoscope, a convenient instrument for determining disturbances of color perception in the macula. *Arch. f. Augenheilk.*, xxxvii., p. 225.

333. BLOEBAUM. The operative use of the new aseptic galvano-caustic incandescent needles in certain eye diseases. *Wochenschr. f. Therap. u. Hyg. des Auges*, 1898, No. 48.

334. SCHULEK. Instruments and particularly capsule forceps for the Graefe cataract operation. *Ungarische med. Presse*, 1898, No. 42.

335. HINSHELWOOD. The use of holocain in ophthalmic practice. *Brit. Med. Journ.*, Sept., 1898, p. 619.

336. EATON. A reflecting tropometer based on trigonometrical measurements. Preliminary communication. *Ophth. Record*, Sept., 1898.

337. MULLEN. The use of suprarenal-capsule extract in minor eye surgery. *Amer. Journ. of Ophth.*, Aug., 1898.

338. STARKEY. The galvanic current for treatment of pterygium. *Journ. Amer. Med. Assoc.*, Sept. 17, 1898.

339. COLEMAN. A report of some cases treated by electricity. *Annals of Ophth.*, July, 1898.

340. WOODRUFF. The de Zeng refractometer. *Amer. Journ. of Ophth.*, July, 1898.

341. RANDOLPH. Conclusions from clinical and bacteriological experiments with holocain. *Journ. Amer. Med. Assoc.*, Sept. 24, 1898.

342. BAXTER. An arrangement for testing the obliques at a distance. *Ophth. Record*, July, 1898.

DALÉN (327) finds, contrary to the general reports, that holocain 1% affects the corneal epithelium even more than 4% cocaine does. But, as respects the delay in the healing of corneal wounds when

cocaine is used, he finds that neither cocaine nor holocain disturbs the healing. Holocain acts quicker in inflamed eyes, but cocaine has the advantage of contracting vessels and thus diminishing hemorrhage during operations. DALÉN.

OSSWALT (330) finds that in − lenses the meniscus or plano-concave glass is preferable to the biconcave, but that in + lenses the meniscus form has no advantages over the other.

SCHULEK (334) describes a number of instruments which he uses in cataract operations. His capsule forceps is of ordinary size, and is bent at an angle of 30°, 6 *mm* from its end. The branches behind the angle do not come in contact when the forceps is closed, thus protecting the iris. The entire end of the forceps is toothed with sharp teeth which point somewhat downward when the branches of the forceps are open but come together smoothly when the branches are closed. HERRNHEISER.

HINSHELWOOD'S (335) conclusions are that holocain has no other effect, except the production of anæsthesia, on the eye. It is not superior to cocaine except in the rapidity of action. It is also a powerful antiseptic. Solutions do not keep longer than a fortnight. WERNER.

EATON (336) has conceived a plan for measuring the excursion of the eyes subjectively, by the proper use of two parallel mirrors and a set of test objects which are reflected from those mirrors into the eye of the observer. The laws of trigonometry will give the amount of rotation from a primary position. This is only a preliminary communication and details of the construction of the instrument and its use are not given. BURNETT.

MULLEN (337) uses Armour's extract of suprarenal capsule in the strength of 5 grs. to a dram of boric acid solution. He has found it useful in producing ischæmia of the conjunctiva in the various operations on that membrane, after cocaine anæsthesia. The astringent effect lasts for from an hour to an hour and a half and is followed by no bad effects. BURNETT.

STARKEY (338) has tried electrolysis in the treatment of pterygia and he thinks with some show of success. In 50 % the cure has been radical and in 20 % the growth has recommenced at a later period. He uses a platinum needle introduced into the growth, the other pole held in the hand; strength of current 1 to 3 milliampères; duration of sitting 1 to 2 minutes. BURNETT.

Among the affections of the eye treated by the constant current of electricity reported by COLEMAN (339) are optic atrophies,

opacities in the vitreous, and asthenopia. The anode is applied to the nape of the neck and the cathode over the closed lids for 5 to 10 minutes daily. He is satisfied that treatment was beneficial in most of the cases. BURNETT.

From his experience with the de Zeng refractometer, WOODRUFF (340) deems it, on the whole, unsatisfactory and unreliable so far as astigmatism is concerned. It does not dispense with a cycloplegic; it is not a time saver and is expensive.

BURNETT.

RANDOLPH (341) had demonstrated by experiments that holocain in the strength employed in ophthalmic practice (1%) possesses distinct germicidal properties. BURNETT.

BAXTER'S (342) apparatus for testing the obliques at a distance consists of two sets of Maddox rods, one before each eye, so arranged that they can be rotated. An indicator shows how much any given rotation may be. The images of the distant point of light, converted into lines, are separated by a double prism placed behind the frame bearing the rods. When the images are thus separated, if there be any fault in the obliques there will not be a parallelism of the two sets of lines as in a normal condition, but an obliquity of one or the other. The rotation of one or the other set of prisms necessary to bring about a parallelism will show the amount of deviation exposed in degrees. (Dr. G. H. Price, of Nashville, claims in the same number of the journal, that he suggested a similar method in 1894 at the San Francisco meeting of the Amer. Med. Assoc.) BURNETT.

Sections IV.—VII. Reviewed by Dr. BERNHEIMER, VIENNA.

IV.—ANATOMY.

343. TERRIEN. Researches on the structure of the pars ciliaris retinæ and the origin of the fibres of the zonula. *Arch. d'opht.*, xviii., No. 9.

344. PERGENS. The pigmented spots in the negro's conjunctiva. *Ann. d'ocul.*, cxx., p. 42.

345. WIDMARK. On the location of the papillo-macular bundle. *Reports of the Caroline Med.-Chirurg. Institute in Stockholm.* Stockholm-Jena, 1898.

346. SCHOUTE. Vena vorticosa in the posterior portion of the eyeball. *Graefe's Archiv*, xliv., 2, p. 357.

347. BERNHEIMER. Experimental investigations on the pupillary tracts. *Sitzungsber. d. k. Akad. d. Wissenschaften in Wien. Mathem.-naturw. Classe,* cvii., 3, May, 1898.

According to TERRIEN (343) the ciliary portion of the retina consists of two cell layers and the supporting fibres. He regards the inner layer of unpigmented cells (pars ciliaris retinæ proper) as a continuation of the inner nuclear layer of the retina. The supporting fibres, according to his view, are attached to the lamina vitrea, pass through both layers of cells, and, ending in part on the surface of the cells, form the limitans interna. In part they pass out as fine fibres which become zonula fibres.

PERGENS (344) finds that the pigment which surrounds the cornea in the negro lies in the basal cells of the epithelium, and even up to the superficial cells. Venneman, however, believes that the pigment occurs only in stellate cells lying among the epithelial cells. SULZER.

WIDMARK (345) had the opportunity of examining a case of tobacco retro-bulbar neuritis anatomically. He was able to trace the degenerated bundle through the optic tract to its entrance into the external geniculate body. The location of the bundle peripheral to the chiasm agreed with that which has previously been found. In the chiasm the bundle lies dorso-medial. Farther up in the tract it passed gradually outward. At the margin of the cerebral peduncle it reached the upper-outer limit of the tract. About the middle of the peduncle it came inward somewhat but still remained lateral, and this location was maintained to the end of the tract. In the anterior part of the external geniculate ganglion it lay dorso-lateral. The degeneration was most marked just anterior to the optic canal, which speaks against Nuel's view that tobacco amblyopia is due to a primary disease of the ganglion-cell layer of the retina with secondary simple atrophy of the papillo-macular bundle. DALÉN.

BERNHEIMER (347) had studied the anatomical relations between optic nerve and oculomotor nucleus in embryo human brains, and in monkeys in which atrophy had been produced. Besides this, animals were examined as to pupillary reaction after section of one tract and after antero-posterior division of the chiasm. He concludes that (1) the visual fibres semidecussate in the chiasm; (2) the pupillary fibres also semidecussate; (3) the pupillary fibres run with the visual fibres through the tract, and only in the region of the geniculate bodies do they turn in toward

the median line to reach the sphincter nucleus, which lies in the anterior corpus quadrigeminum beneath the aquæduct; besides this connection of each eye with both sphincter nuclei there is a central communication of the two sphincter nuclei.

V.—PHYSIOLOGY.

348. BIETTI. On a new method of determining alterations in the color sense. *Annali di ottalm.*, i., 11, 1898.

349. PASCALE. The color sense in man. *Giornale medico del R. esercito*, No. 9, 1898.

350. WIDMARK. On the limit of the visual spectrum at the violet end. *Mitth. a. d. Augenklinik d. Karol. Med. Chirurg. Institutes zu Stockholm*, Jena, 1898.

351. PERGENS. The retinal chaos and its relations to the threshold excitability of the retina. *Ann. d'ocul.*, cxx., p. 98.

352. DRUAULT. On the production of colored rings about a flame. Description of a physiological ring. *Arch. d'opht.*, xviii., 5, p. 312.

353. SALOMONSOHN. On diffraction in the cornea and lens. *Arch. f. Anat. u. Physiol., Phys. Abth.*, 1898.

354. HESS. On the effect of the refractive index of the aqueous humor on the total refraction of the eye. *Monatsbl. f. Augenheilk.*, Aug., 1898.

355. HESS. Remarks on accommodation. *Graefe's Archiv*, xlvi., 2, p. 440.

356. HESS and HEINE. Studies on accommodation. IV.—Experimental investigations on the influence of accommodation on intra-ocular tension, with remarks on accommodation in the mammalia. *Graefe's Archiv*, xlvi., 2, p. 243.

357. HEINE. The condition of intra-ocular tension in accommodation. *Centralbl. f. Physiol.*, xii., No. 13.

358. KNIES. On a frequent but previously disregarded form of congenital violet blindness and on color anomalies in general. *Arch. f. Augenheilk.*, xxxvii., 3, p. 234.

359. TURNER. Experiments on the production of complementary color sensations. *Brit. Med. Four.*, Sept., 1898, p. 777.

360. GOULD. A case of "mathematically perfect eyes." *Four. Amer. Med. Assoc.*, Sept. 17, 1898.

361. BREWER. Homonymous torsion, a position of the retinal meridians hitherto unrecognized. *Ophth. Record*, Sept., 1898.

362. PRATT. The rods and epithelial pigment layer of the human retina considered as a photo-chemical or sensitive plate. *Med. Record*, Aug. 27, 1898.

In view of the unsatisfactory results obtained in using the various instruments proposed for determining unilateral color defects by means of the binocular comparison of colors, BIETTI (348) has modified an apparatus of Gaudenzi's with which, when each eye observes a separate test object, the retinal images of the two are projected at one spot, and thus by comparing the two images any defect in color perception in one eye may be detected. In conclusion, the author cites three cases in which very accurate diagnoses of paracentral color scotomata were made.

KRAHNSTÖVER.

According to WIDMARK (350), the views entertained in regard to the sensibility of the retina to the ultra-violet rays differ considerably. Donders considered these rays invisible, Mascart thought that the retina was very sensitive to them. Widmark examined fifty-nine persons, using a grating spectroscope, and came to the following conclusions. The normal human eye perceives only a few of the ultra-violet rays, but the limit of the visible spectrum varies in different individuals, being usually, however, between L and M. The rays are visible directly and not through fluorescence. Older persons see fewer of the violet rays than the young, but in aphakic persons the limit of perception is extended. DALÉN.

DRUAULT (352) describes a ring of spectral colors which appears when a person with dilated pupils looks at a light. It is due to diffraction in the lens and is partly cut off when a portion of the pupil is covered with a screen. v. MITTELSTÄDT.

Many have explained a transient myopia in emmetropic eyes by supposing an increased refractive index of the aqueous humor. Computations made by HESS (354) show that if the refractive index of the normal aqueous (1.3365) be increased to 1.377 in an emmetropic eye, a myopia of only 1.7 D would be produced. These transient myopias can be due in part only to such a change in the aqueous, since to produce 1.5–2.D of myopia the aqueous would need to be of a refractive index equal to or greater than that of the cornea.

HESS and HEINE (356) have produced contraction of the ciliary

muscle by excitation of the ciliary ganglion, or by direct excitation through the sclera, in various animals, and have studied the tension of the accommodated eye. Accommodation in cats, dogs, and rabbits is rudimentary, amounting only to 1.–3. D, while in monkeys it is at least 10.–12. D. Accommodation has no effect upon intra-ocular tension.

KNIES (358) has already described an anomaly of color perception in which violet is not recognized while all the other spectral colors are seen properly. This form of color-blindness he finds to be very frequent, and after examining his patients more carefully he now discusses its relations to other forms of color-blindness.

TURNER (359) showed an experiment of Bidwell's: it consists of a rotating disc, which has a black surface, followed by an open space through which the color is seen, and following this a white area, on which the persistent retinal impression is seen. At a certain speed of rotation, the original color is not seen, but only the color complementary to it. WERNER.

In GOULD'S (360) case the patient had recurring conjunctival hemorrhages. The eyes had been pronounced "mathematically perfect," but it was finally made out that he had a low degree of astigmatism — 0.25, 90° in right, 180° in left. A constant wearing of these glasses was followed by a cessation of the hemorrhages and other annoying symptoms. BURNETT.

A study of the retinal meridians by means of his torsiometer has shown BREWER (361) that the vertical meridians in a normal condition are perpendicular to the horizon and parallel, yet there are exceptional conditions, of which he relates several, in which these meridians, though still parallel, are inclined either to the right or left, sometimes as much as 6°. This will cause us to modify our ideas of the vertical horopter as given by Helmholtz.

BURNETT.

PRATT (362) advances the idea that the rods and hexagonal cells of the retina secrete the photo-chemical substance which is acted upon by light, and this action is transmitted to the cones which are the true percipient elements. BURNETT.

VI.—REFRACTION AND ACCOMMODATION.

363. TROMBETTA. The determination of astigmatism. *Giornale med. del R. esercito*, 1898, No. 4.

364. SCHEFFELS. On the final results in the operative treatment of myopia. *Zehender's klin. Monatsbl.*, xxxvi., p. 337.

365. JENNINGS. A case of hyperopic astigmatism changing to mixed astigmatism after tenotomy of the internal recti muscles. *Ophth. Record*, Aug., 1898.

TROMBETTA (363) presents Martin's statistics, according to which a large percentage of all eyes are astigmatic. He then takes up the various methods of determining astigmatism. The use of the ophthalmometer he commends most highly as being the quickest, most accurate, and most convenient method. In low degrees of astigmatism retinoscopy is the most accurate, but in the author's opinion the ophthalmoscopic determination should always be used for control. KRAHNSTÖVER.

In JENNINGS's (365) case the refraction before the division of the interni for esophoria of 8°, was R + 1, 120°; L + 1, 60°. After the operations, which were successful in removing the esophoria, the refraction was found to be R — 1.5 ⊃ + 2.5, 105°; L — 0.5 ⊃ + 2.5, 75°. No report of an ophthalmometric examination is given. BURNETT.

VII.—MUSCLES AND NERVES.

366. PANAS. Pathogenesis and treatment of functional strabismus. *Arch. d'opht.*, xvii., 7, p. 401.

367. SMITH, PRIESTLEY. Tenotomy for strabismus; a simplified operation. *Ophth. Review*, xvii., p. 101.

368. FITZGERALD. Some anomalies of the ocular muscles. *Brit. Med. Jour.*, Sept., 1898, p. 699.

369. MOORHEAD, G. SIMS. Post-diphtherial paralysis. *Ibid.*, p. 593.

370. PERCIVAL. A case of acquired nystagmus. *Ibid.*, June, 1898, p. 1583.

371. STARR, E. G. A method for determining latent hyperphoria. *Annals of Ophth.*, July, 1898.

Concomitant strabismus, according to PANAS (366), is a functional disturbance of convergence which is almost always of peripheral origin and, therefore, requires operative treatment of both eyes. Panas recommends operation at the age of seven to nine, as soon as non-operative treatment has proved to be fruitless. He prefers tenotomy to advancement, the latter being used only in high degrees of divergence. Panas operates in narcosis and stretches the muscle, before dividing it, by passing the squint hook under it and then turning the eye outward until the inner

margin of the cornea reaches the outer commissure. Of 210 cases of convergent strabismus the position of the eyes was corrected at once in 180, while a slight convergence remained in 30, but in none did divergence occur. In conclusion, the author presents a historical sketch of the various views on the development and treatment of squint. v. MITTELSTÄDT.

PRIESTLEY SMITH (367) makes a horizontal incision along the lower border of the tendon, hooks it up, and then catches it with a clamp forceps, something like Prince's, just behind the hook. The latter is then withdrawn and conjunctiva and tendon divided in front of the clamp. The central needle of the suture is passed through the tendon and conjunctiva in the usual way, behind the clamp, and the piece of tendon included in the clamp is cut off. Before passing the sutures in front, the author tunnels under the anterior stumps of the tendon and superficial layers of sclerotic with a keratome. WERNER.

FITZGERALD'S (368) subject was a man æt. twenty-six. In the left orbit a muscular slip arose from the tendon of origin of the external rectus and passed inwards, blending with the centre of the internal rectus. In both orbits a slip arose from the tendon of origin of the lev. palp. sup., passed inwards under the superior oblique, and divided into two portions, one of which joined the front of the lev. palp. sup. and the other attached itself to the frontal bone below and in front of the trochlea.

WERNER.

This paper (369) treats at length of diphtherial paralysis in general. Of the oculomotor paralyses the bulk occurred between the fourth and seventeenth days, none before the fourth; one case occurred as late as the ninety-first day. The author was satisfied that antitoxin had no power of setting up paralysis by itself. WERNER.

PERCIVAL'S (370) patient developed vertical nystagmus from running the eyes up and down the pages of a large book; there was slight hemeralopia. The room in which he worked was well lighted. WERNER.

A method which STARR (371) has found most satisfactory for discovering any latent heterophoria is to exclude one eye absolutely from vision and light by means of a patch or blinder, for a period of twelve hours. Upon removal of the blinder he finds that the latent heterophoria has become manifest.

BURNETT.

VIII.–XII. Reviewed by PROF. SILEX, Berlin.

VIII.—LIDS.

372. ANGELUCCI. A new operative procedure for inflammatory and senile ectropium of the lower lid. *Rev. génér. d'opht.*, xvii., p. 385.

373. STEINHEIM. Epicanthus with ptosis, and heredity. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 249.

374. BERGER, H., and LOEWY, R. A new operative procedure for epicanthus. *Arch. d'opht.*, xviii., 6, p. 453.

375. ROGMAN. A case of hyaline degeneration of the lids. *Ann. d'ocul.*, cxx., p. 89.

376. ARGYLL-ROBERTSON. Note on a method of operating for ectropion of the lower eyelid. *Brit. Med. Jour.*, June, 1898, p. 1504.

377. FALLOWS. Case of polypoid growth from a Meibomian cyst. *Ibid.*, Sept., 1898, p. 620.

378. NEVE. On the surgical treatment of cataract. *Ibid.*

379. CHEATHAM. Sclerodermic papilloma of the lower lid. *Annals of Ophth.*, July, 1898.

ANGELUCCI (372) in inflammatory ectropium separates the skin and the orbicularis from the tarus of the lower lid, thus dividing the lid into two layers. After this dissection the anterior layer of its own accord assumes its proper position, and the tarsus slips downward and remains there without requiring to be held in place by sutures. SULZER.

STEINHEIM (373) reports the case of a family in which in the course of five generations epicanthus and ptosis were noted fifteen times.

In a girl of sixteen, BERGER and LOEWY (374) corrected a bilateral epicanthus by excising a triangular flap of skin on each side between the bridge of the nose and the fold. The excision of crescentic and elliptical flaps was also followed by good cosmetic results. v. MITTELSTÄDT.

In an otherwise healthy man of fifty-five, ROGMAN (375) found a marked enlargement of the tarsus of the left upper lid, which had remained unchanged for years. The skin was normal and, like the conjunctiva, was movable over the tarsus. The lids of the other side exhibited smaller tumors of the same nature. Microscopic examination of excised bits showed that it was a case of hyaline

degeneration of the lids. In spite of the long continuance of the hyaline degeneration there was no trace of amyloid degeneration.

SULZER.

ROBERTSON (376) makes a flap with a broad base which lies close to, and parallel with, the outer half of the lid margin and extends in a curve upwards external to the outer canthus. This flap is dissected up and a wedge-shaped piece cut out of the lid margin. The flap is then drawn up, until the lid is in position, and sutured higher up. WERNER.

In CHEATHAM'S (379) case a man had a burn on the lower lid by a piece of hot metal. Some years after, a tumor appeared on the conjunctival edge of the lid. It was excised and found to be a sclerodermal papilloma. BURNETT.

IX.—LACHRYMAL APPARATUS.

380. AXENFELD. On the histology and physiology of the lachrymal musculature. *Report of Heidelberg Ophth. Soc.*, 1898; *cf. Arch. f. Augenheilk.*, xxxviii., 1, p. 116.

381. SUK. Two cases of dacryocystitis opening in an unusual direction. *Wiener klin. Wochenschr.*, No. 25, 1898.

382. BUSINELLI. Phlegmon of the orbit consecutive to phlegmon of the lachrymal sac. *Clinica moderna*, iv., No. 30.

383. PARISOTTI. Polyp of the lachrymal canal. *Bull. della R. Accad. med. di Roma.*, ii., iii., 1898.

384. MITVALSKY. Actinomycosis of the lachrymal sac. *Arch. d'opht.*, xviii., 8, p. 508.

SUK (381) found in the literature only five cases of dacryocystitis opening backward and causing phlegmon of the orbit. In two further cases a slight injury of inflamed tear passages led to infection of the orbit, and later of the cranial cavity. He records two cases of his own in which pus from a dacryocystitis extended backward. The prognosis as regards sight is doubtful.

BUSINELLI (382) records another case in which a phlegmon of the sac opened into the orbit. Recovery took place after operation, but the optic nerve became atrophic.

KRAHNSTÖVER.

PARISOTTI (383) adds another to the two reported cases of polyp in the canaliculi. A second operation was required before the lobulated polyp and its pedicle were removed completely.

KRAHNSTÖVER.

In a woman aged sixty with a lachrymal fistula MITVALSKY (384) found a hard swelling of the lachrymal sac which gave him the impression of being a tuberculous periostitis. On incising it there appeared a green mass composed of the fungus which here and there had undergone a degeneration owing to the secondary immigration of staphylococci. The chronic inflammation of the lachrymal sac makes possible the actinomyces infection, the author believing that the normal sac does not offer favorable conditions for its growth. V. MITTELSTÄDT.

X.—ORBIT AND NEIGHBORING CAVITIES.

385. BLOCH. The value of local anæsthesia; fistula above the eye of three years' duration healed after removal of a splinter of wood from the orbit. *Die Heilkunde*, 1898, No. 12.

386. HOFFMANN. A case of empyema of the sphenoidal sinus with involvement of the orbit. *Verhandl. d. Deutschen Otolog. Gesellsch.*, 1897, Jena.

387. FRANKE. On traumatic enophthalmus. *Zehender's klin. Monatsbl.*, xxxvi., p. 225.

388. WERNER. On pulsating exophthalmus. *Inaug. Dissert.*, Tübingen, 1898.

389. LESSHAFT. Periodic exophthalmus of the right eye due to movements of the head. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 264.

390. SSOKALOW. Temporary resection of the outer orbital wall in removing retrobulbar tumors. *Wratsch*, 1898, No. 33.

391. WINTERSTEINER. Lymphangioma cavernosum orbitæ. *Graefe's Archiv*, xlv., p. 613.

392. BIETTI. A contribution to the study of the osteomas of the orbit. *Annali di ottalm.*, i.–ii., 1898.

393. SCHIRMER. A case of cholesteatoma of the orbit. *Beiträge z. Augenheilk.*, xxxiv.

394. USHER. A case of cavernous angioma of orbit. *Brit. Med. Jour.*, Sept., 1898, p. 621.

395. MILLER, V. Exophthalmic goitre with unilateral eye symptoms. *Ibid.*, p. 629.

396. HINSHELWOOD. A case of exophthalmic goitre with unilateral eye symptoms. *Ibid.*, June, 1898, p. 1653.

397. WEBSTER. Sarcoma of the orbit. *Med. News*, Aug. 27, 1898.

BLOCH (385) reports that under anæsthesia produced by Schleich's infiltration method he penetrated 4 *cm* into the orbit and removed a bit of wood which had been carried in by an explosion three years before and had produced a fistula.

HERRNHEISER.

HOFFMANN (386) reports the case of a woman of twenty-nine who suffered from empyema of the sphenoidal sinus and, besides the characteristic symptoms of this disease, with a whole series of ocular disturbances. In the beginning there were ptosis, myosis, pain in moving the eyes, V = $\frac{1}{200}$, and later diplopia. After several slight operative procedures, the empyema was radically operated upon. The pus not escaping freely from the sphenoid, a well-marked neuritis developed, with further failure of vision, supraorbital pain, and muscular paralysis. The ocular symptoms subsided only after the conditions for the outflow of pus were improved.

FRANKE (387) reported three cases of enophthalmus, and believed that in two the cause was fracture of the orbital wall. A portion of the orbital fatty tissue protrudes and draws the eyeball backward. In the third case there was probably paralysis of Müller's orbital muscle or an injury of the sympathetic twig supplying it.

WERNER (388) adds another case of pulsating exophthalmus to the 168 recorded cases, which is of interest because carefully watched in its entire course. There was a fracture at the base of the skull passing through the optic canal, which at first only caused an interruption of the retinal circulation as if there had been an embolism. Later there occurred, probably from a spicula of bone detached from the anterior clinoid process, an injury of the carotid in the cavernous sinus causing pulsating exophthalmus and paralysis of the external rectus. Digital compression of the carotid was fruitless, and the artery was ligated. Four months later the effect was good and seemed to be permanent.

In LESSHAFT'S (389) case, when the patient held his head straight the right eyeball appeared slightly retracted. When he bent forward the ball protruded 15 *mm* and vision became poor. Sixteen similar cases are on record. The cause is probably a varicose dilatation of the orbital veins.

SSOKALOW (390) removed a cavernous angioma as large as a

hen's egg from the orbit with preservation of the ball, making Krönlein's temporary resection of the outer wall of the orbit. The four perforations for the sutures were bored before the bony flap was chiselled off. The result was satisfactory and the vision returned in part. HIRSCHMANN.

WINTERSTEINER (391) extirpated from the orbit of a boy aged twelve years, a lymphangioma cavernosum. The diagnosis rested on the abundant lymphoid tissue and typical lymph follicles in the various parts of the tumor, together with the presence of blood and lymph in the cavities, and the continuation of the cavernous spaces with the perivascular lymph spaces which traverse the sclera along the posterior ciliary arteries. Three similar cases are reported in the literature.

BIETTI (392) reports a case of osteoma of the roof of the orbit in a young girl. It had apparently developed from the periosteum. The author discusses these bony tumors in general, and gives a microscopic description of his own specimen.

KRAHNSTÖVER.

SCHIRMER (393) reports a case of tumor of the orbit which was diagnosed dermoid, but at the operation proved to be cholesteatoma. There was evacuated an incredible amount of a moist, fatty, whitish mass, of pulpy consistency, which was composed of laminæ of cells interspersed with cholestrin crystals. The operation was not followed by complete recovery, and the fistulous opening that remained continued to discharge the whitish masses.

In USHER's (394) patient, a man aged forty, the growth was situated within the muscular cone, was elastic, dark blue, and nodular. The symptoms were: V = p. l.; disc pale. Proptosis. No pulsation, bruit, or tenderness. Frontal headache. Duration probably five or six years. WERNER.

MILLER's (395) patient, a young woman, unmarried, presented right exophthalmos with Stellwag's and Graefe's signs; right lobe of thyroid enlarged, distinct tachycardia, and nervous excitability.

WERNER.

HINSHELWOOD's (396) patient, a woman aged twenty-four, had slight exophthalmos of the left eye, with marked retraction of the upper lid and Graefe's symptom. There was uniform enlargement of the thyroid but no palpitation. The staring appearance was observed about five or six weeks before treatment, which consisted in administration of antipyrin. In three months from the onset, patient was well, except that Graefe's sign could still be

obtained. The persistence of the latter led the author to think that the cause of this phenomenon must be different from that of the retraction of the lid. WERNER.

WEBSTER'S (397) case was a man of thirty-one years, who had slowly growing exophthalmos of the right eye. It proved to be due to an orbital growth which seemed to be periorbital in its extent, and was removed, leaving the eye in the orbit, as it seemed healthy and had good vision. Panophthalmitis, however, set in soon after, and the eye went on to atrophy. There was no return of the growth which was adjudged a sarcoma, in the orbit, but it was learned that he died nine months after of cancer of the throat. BURNETT.

XI.—CONJUNCTIVA.

398. DAXENBERGER. Symblepharon operation by electrolysis. *Wochenschr. f. Therapie u. Hygiene d. Auges*, 1898, No. 40.

399. FURTHMANN. On symblepharon operations. *Inaug. Dissert.*, Kiel, 1898.

400. COHN, H. On the frequent and benign swelling of the conjunctival follicles in school children. *Berl. klin. Wochenschr.*, 1895, No. 25.

401. COHN, H. Historical notice on the differential diagnosis of trachoma and folliculosis. *Wochenschr. f. Ther. u. Hyg. d. Auges*, 1898, No. 44.

402. HELLGREN. On the mechanical and therapeutic treatment of trachoma. *Mitth. a. d. Augenklinik d. Karol. Med. Chir. Institutes zu Stockholm*, Jena, 1898.

403. HOOR. A remark on Prof. Leber's paper on Kalt's irrigations. *Zehender's klin. Monatsbl.*, xxxvi., p. 261.

404. MORAX and PETIT. Clinical and bacteriological considerations on the acute inflammations of the conjunctiva. *Ann. d'ocul.*, cxx., p. 161.

405. WINTERSTEINER. On cysts and concrements in the palpebral and retrotarsal conjunctiva. *Graefe's Archiv*, xlvi., 2, p. 329.

406. WESTHOFF. Pigmentation of the conjunctiva. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 248.

407. STEPHENSON. The diagnosis of diphtheria of the conjunctiva. *Brit. Med. Journ.*, June, 1898, p. 1578.

408. GIFFORD. Five cases of Parinaud's conjunctivitis. *Amer. Jour. of Ophth.*, July, 1898.

409. WOOD, C. A. Removal of the tarsus and retrotarsal folds in certain cases of chronic trachoma. *Annals of Ophth.*, July, 1898.

410. MORTON, H. McI. Restoration of the fornix conjunctivæ for retention of prothesis. *Ophth. Record*, Aug., 1898.

DAXENBERGER (398) reports a case of symblepharon of the upper and lower lids in which he was able in repeated sittings to destroy the adhesions permanently by electrolysis.

FURTHMANN (399) reports two operations done by Völkers for adhesions between lid and eyeball. In both a flap of skin from the patient's lower lip was transplanted to the exposed portion of the ball, with good result.

HELLGREN (402) speaks of the various mechanical and operative measures employed in trachoma, and reports forty-two cases in which expression was employed. In follicular conjunctivitis and granular trachoma the results were excellent, and even in partly cicatricial cases improvement was obtained. In a few cases a second operation was required and in some an inflammation of the cornea followed the expression. DALÉN.

HOOR (403) does not believe in Kalt's irrigations. In the first place we should avoid bringing any instrument inside the lids, and in the second place the cornea should not be flooded for a long time, even with weakly antiseptic liquids. Both should be avoided for the purpose of protecting the corneal epithelium. He prefers washing out the eyes every half hour.

MORAX and PETIT (404) state that the Weeks bacillus, the diplo-bacillus, and the gonococcus when inoculated on the conjunctiva always bring about an inflammation and then disappear when this passes off. The ordinary habitants of certain mucous membranes, such as the pneumococcus and some varieties of the streptococcus, only produce inflammation under certain ill-understood conditions. A third class of micro-organisms are able to produce inflammation only when the mucosa is prepared by a previous infection. In this class are the diphtheria bacillus, the staphylococcus, and the ordinary streptococci. Gifford's experiments show, however, that experimental pneumococcus infection of the conjunctiva is possible. The Weeks bacillus not only causes conjunctivitis but also superficial ulcers of the cornea.

SULZER.

WINTERSTEINER (405) describes 1. Atypical retrotarsal glands, and the formation of serous cysts in the retrobulbar and tarsal conjunctiva. The cysts found here arise mostly from a proliferation of the superficial epithelium. 2. Cysts with concrement formation in Krause's glands. 3. Concrement formation in Henle's glands.

STEPHENSON (407) records two cases of diphtheritic conjunctivitis in which the diagnosis was confirmed by the demonstration of the Klebs-Loeffler bacillus. He points out that presumptive evidence can be derived from the history, the co-existence of diphtheria of other parts, loss of knee jerks, albumen in the urine. A membrane may exist with conjunctival inflammations caused by pneumococci, Weeks bacillus, pus cocci, chemical injuries, while it may occasionally be absent where the Klebs-Loeffler bacillus is present. This bacillus resembles the xerosis bacilli but differs in the following points: 1. The diphtheria organism loses its gentian violet, when in alcohol, much more quickly than the xerosis bacillus. 2. The diphtheritic bacillus gives rise to an acid reaction in neutral bouillon. 3. The xerosis bacilli only cause a local swelling when inoculated in guinea-pigs.

WERNER.

GIFFORD (408) here reports five cases of a particular form of conjunctivitis first described in France by Parinaud and Despagnet, characterized by knobby swellings on the conjunctiva, which finally suppurate. The whole aspect of the disease points to an infection, and the French authors consider it of animal origin, as some of the patients had to do, in some way, with dead animal matter. None of Gifford's cases was so occupied, and he thinks this theory not proven.

Though he has made a number of investigations, up to this time he has not been able to settle upon any particular cause. The cases usually get well in from two to six weeks. The treatment that has been found most satisfactory is by nitrate of silver, copper, and, when the granulations are large, clipping them off.

BURNETT.

WOOD (409) has operated upon fourteen cases of chronic trachoma by removing the tarsus and retrotarsal folds after the manner described by Kuhnt at the Moscow Internat. Med. Congress. He is so much pleased with the results that he does not hesitate to recommend the operation to his confrères, particularly in those old cases where the tarsus is involved and where the

trachoma follicles are implanted in the connective tissue of the retrotarsal folds. BURNETT.

MORTON'S (410) procedure is to incise the conjunctiva from canthus to canthus, inside of and parallel to the lid margin, deeply. Into the gap thus made he inserts a Thiersch graft of skin, and unites it only on the outer side to the conjunctiva. On this graft he at once implants as large an artificial eye as can be inserted. This holds the graft firmly in place and facilitates union. BURNETT.

XII.—CORNEA, SCLERA, AND ANTERIOR CHAMBER.

411. WAGENMANN. On a case of keratoconus with pulsatory variation in the size of the diffusion circles due to pulsation of the cornea. *Graefe's Archiv*, xlvi., 2, p. 426.

412. TENDERING. On corneal sclerosis. *Inaug. Dissert.*, Erlangen, 1898.

413. PETERS. On gummous affections of the cornea. *Düsseldorf, 70. Naturforscherversammlung*, 1898.

414. BARENDRECHT. On the pathological formation of vessels in the cornea. *Inaug. Dissert.*, Amsterdam, 1898.

415. VAN MILLINGEN. Congenital absence of the first and second branches of the fifth nerves; bilateral neuro-paralytic keratitis. *Ann. d'ocul.*, cxx., p. 202.

416. PELTESOHN. Hereditary syphilis and keratoma lacia. *Deutsche med. Wochenschr.*, No. 18.

417. SCHMIDT-RIMPLER. On ulcus rodens. *Report of the Heidelberg Ophth. Soc.*, 1898; *cf. Arch. f. Augenheilk.*, xxxviii., 1, p. 124.

418. MATSCHULSKY. A case of gumma of the sclera. *Wojenno Med. Jour.*, Aug., 1898.

419. CLAVELIER. Recovery of an episcleritis developing with herpes zoster, after treatment by electrolysis. *Ophth. Klinik*, 1898, 15, p. 274.

420. GRADLE. The detection of unsuspected corneal changes by examination with strong lenses and focal illumination. *Ophth. Record*, Sept., 1898.

WAGENMANN'S (411) patient had an excessive keratoconus in one eye and objects observed with this eye alternately became larger and smaller. Examination with the Placido disc showed

an alteration in the size of the image reflected from the centre of the cornea synchronous with the radial pulse. The bulging of the cornea, producing myopia and consequently micropsia, was due to the pulsation of the vessels of the retina and uveal tract transmitted through the vitreous, lens, and aqueous to the cornea.

TENDERING (412) reports a carefully examined case of so-called corneal sclerosis observed by Eversbusch, which in the beginning was considered to be an atypical interstitial keratitis, and whose true nature was only discovered after long observation. The cornea became cloudy and dense without any signs of clearing, and, in the middle, underwent a fatty degeneration. Signs of conjunctival irritation were wanting. It would seem to have been a purely regressive metamorphosis caused possibly by an endarteritis obliterans of the vessels.

PETERS (413), excluding typical parenchymatous keratitis, describes those forms of corneal inflammation which are the direct manifestations of syphilis. He reports a case in which gummous products in the cornea break down rapidly under the use of mercury, and also two cases in which the cornea exhibited small isolated gummous tumors.

According to BARENDRECHT (414), in cases of infection of the eye from pathogenic bacteria, new vessels form in the cornea, springing from the marginal vessels, and lying chiefly in the anterior third of the cornea. These vessels form a network ending in a ring about the centre of the cornea. In the cornea many cloudy spots appear, due to the swelling and separation of the corneal lamellæ from inhibition. Leucocytes are present only in small number. The cornea, later, becomes clear, although the vascular network long remains. These corneal changes are due to the action of the products of metabolism arising from the microorganisms in the vitreous. The injection of dead spores does not give rise to the formation of vessels, but the injection of irritating substances does. WESTHOFF.

In a Turkish girl of six, whose parents noticed soon after birth that the eyes were insensible, VAN MILLINGEN (415) found deep corneal ulcers and pyramidal cataract in each eye. There was no protophobia, no lachrymation, and he found absolute anæsthesia of the cornea and conjunctiva, forehead, cheek, upper lip, and nose. Suturing the lids quickly cured the ulceration, and an iridectomy was done painlessly. The absence of any general or local disease

led Van Millingen to the conclusion that there had been a congenital defect in the fifth pair. SULZER.

PELTESOHN (416) speaks of the etiology of keratomalacia, emphasizing its frequent connection with hereditary syphilis, and in view of the unfavorable prognosis he recommends the use of mercury in every case.

GRADLE (420) examined the cornea under oblique illumination accurately focussed on the corneal tissue with a Coddington lens of $\frac{1}{2}$ or $\frac{3}{4}$ inch focus. In this way he has been able to detect diffuse corneal opacities after cataract operations; also a diffuse cloudiness of the corneal tissue in some cases of persistent asthenopia where the optic correction did not bring vision quite up to the normal; also, in some cases, circumscribed infiltrations which were not visible otherwise. BURNETT.

Sections XIII.-XVIII. Reviewed by DR. O. BRECHT.

XIII.—LENS.

421. RITTER. A case of luxation of the lens. *Arch. f. Augenhlk.*, xxxvii., p. 348.

422. WIDMARK. The operative treatment of unripe and of partial stationary cataract. *Mitth. a. d. Augenklinik d. Karol. Med. Chir. Instituts zu Stockholm*, Jena, 1898.

423. CARRA. On the treatment of infection following cataract operations. *Bull. d. R. Acad. Med. di Roma*, xxiv., 4.

424. GUTTMANN. Double refraction in one eye due to nuclear sclerosis. *Centralbl. f. prakt. Augenheilk.*, xxii., p. 193.

425. GUNN, DONALD. Notes on some forms of congenital cataract. *Ophth. Review*, xviii., p. 129.

426. JACKSON. Influence of age in causing opacity of the crystalline lens and the proper use of the word "cataract." *Jour. Amer. Med. Assoc.*, Sept. 24, 1898.

RITTER (421), in a lens luxated first in the posterior chamber and then in the anterior and finally extracted, found degeneration and separation of the superficial layers of fibres, partial destruction of the epithelium, and complete disappearance of the nuclear zone.

WIDMARK (422) discusses the three operations mostly employed in cases of immature cataract for bringing about maturity, viz., discission, iridectomy, and trituration of the cortex. In 1889–90 he tried the method suggested by McKeown and Wicherkiewicz,

that of extracting the immature cataract and washing out the remaining cortical masses by syringing the anterior chamber. The results were not good. Since 1892 he has followed the recommendations of Schweigger: (1) discission in patients under 20; (2) discission for the purpose of ripening between 20 and 40; massage of the cortex between 40 and 60; extraction without any preliminary operation, after the age of 60. Many practical points of importance are discussed in the paper. DALÉN.

After speaking of the various methods of combating infection, CARRA (423) reports three cases in which thorough syringing of the anterior chamber, mechanical removal of exudations, and cauterization of the infiltrated margins of the wound checked an advanced purulent infection and led to the saving of a certain amount of vision. KRAHNSTÖVER.

GUTTMANN (424) describes the case of a woman aged fifty-four who, in 1890, had hyperopia of 1 D in each eye, and perfect sight. For three years the sight has been growing worse. In 1898 L. with + 2, V = $\frac{5}{8}$; R. with — 5, V = $\frac{7}{80}$. Sn. II. from 20 – 10 *cm.* In mydriasis there was found, besides delicate equatorial opacities, a central gray veil-like opacity which proved to be due to nuclear sclerosis. Through the clear periphery of the lens the fundus was seen with + 2 D. In the middle of the lens the refraction was 7 D higher.

GUNN'S (425) paper contains records of cases of congenital cataract, chiefly shrunken or apparently so. In several there was a syphilitic history, and a low mental condition associated with fits. The results of operation were often unsatisfactory not merely as regards vision, but also with reference to the reaction. WERNER.

JACKSON (426) has found from 45 % to 77 % of lens opacities in patients above sixty-five years of age. All these he does not think should be called "cataract," for they very often remain stationary. Eye strain from want of proper glasses and certain acute diseases, and influenza, are developing causes of lenticular opacities. He thinks that most of these patients should not be told that they have "cataract." Albuminuria he has not found to be a cause of lens disease. BURNETT.

XIV.—IRIS.

427. WESTHOFF. Suppurative iritis after the use of iodide of potassium. *Medical Weekblad*, 1898, No. 16.

428. CARRA. Two cases of congenital aniridia. *Bull. d. R. Accad. Med. di Roma*, xxiv., 2.

429. SORGER. A case of spontaneous hemorrhage from the iris and ciliary body into the anterior chamber in a patient with leukæmia. *Münch. med. Wochenschr.*, 1898, No. 35, p. 1120.

In a patient with toxic amblyopia for whom WESTHOFF (427) prescribed iodide of potassium, a purulent inflammation of the iris and ciliary body broke out at two different times, but passed off at once after stopping the use of the drug.

CARRA (428) reports two cases of aniridia. In both cases the defect was bilateral, in both the iris was indicated by a narrow margin only, and in both there were opacities of the lens, there being anterior capsular cataract in two and nuclear cataract in one eye. Aniridia is mostly associated with other malformations, is almost always bilateral, and is rarely total, a narrow margin of iris usually remaining. Frequently there are opacities or anomalies of curvature in the cornea. The lens is usually cloudy and frequently luxated. The vitreous is usually normal; the choroid never colobomatous. Partial aniridia is rarer than total. Glaucoma has sometimes been observed as a complication. Pathological examinations have been made by Pagenstecher, Lembeck, Rindfleisch, and Treacher Collins. The refraction is usually myopic and the accommodation weak. There is often nystagmus, mostly horizontal. An hereditary disposition is frequently present. Manz's theory, that the development of the iris is hindered by the late separation of the lens from the anterior wall of the secondary optic vesicle, is accepted by the author as being satisfactory. KRAHNSTÖVER.

SORGER (429) observed in a case of fatal leukæmia, hemorrhage into the anterior chamber in one eye after the other. The blood was evacuated by paracentesis. This therapy is original but hardly commendable, since hyphæmia is usually spontaneously absorbed, and it is not customary to bleed leukæmic patients.

XVI.—VITREOUS.

430. MANZUKO. On spontaneous hemorrhage into the vitreous. *Beitr. z. Augenheilk.*, xxxiv., 1898.

431. BRYANT. Experiments in the use of aluminum for artificial vitreous. *Jour. Am. Med. Assoc.*, Sept. 24, 1898.

MANZUKO (430) reports some cases of spontaneous hemorrhage

into the vitreous, and speaks of the etiology and the source of these hemorrhages.

BRYANT (431) has used a globe of aluminum in the place of Mules's glass ball in evisceration and also implanted after enucleation with much satisfaction. The improvement he suggests is to have a frame of aluminum instead of a solid sphere. This allows the new tissue to grow in and around the artificial ball and make it more secure. His experiments on dogs seem to have demonstrated the position taken. BURNETT.

XVII.—GLAUCOMA.

432. CARRA. On juvenile glaucoma. *Annali di ottalm.*, v., 1898.

433. JANNESCO. The treatment of glaucoma by resection of the cervical sympathetic. *Rec. d'opht.*, 1898, p. 449.

434. PANAS. A report on Jannesco's (preceding) article. *Arch. d'opht.*, xviii., 7, p. 448.

435. PANAS. Total keratectomy followed by suture. Applications of the method. *Arch. d'opht.*, xviii., No. 9, p. 545.

436. BERNHEIMER. Some remarks on my article and Hirsch's article on glaucoma in aphakic eyes. *Wien. klin. Wochenschr.*, 1898, 29, p. 703 (Polemical).

437. CHEATHAM. Glaucoma with detachment of the retina. *Annals of Ophth.*, July, 1898.

CARRA (432) states that glaucoma is much less frequent in youth than in old age. In the Jewish race not only is glaucoma more prevalent, but it also appears at an earlier age than in other races. The most frequent varieties of the disease seen in early life are the prodromal and the chronic form. The prognosis, especially as respects the results of operation in chronic glaucoma, is better in the young. It is remarkable (but not generally correct—H. K.) that Krannhals's statistics show that in patients under thirty years of age the glaucoma was in every case unilateral. KRAHNSTÖVER.

JANNESCO (433) reports seven cases of glaucoma, among them two of glaucoma simplex, all treated by resection of the upper cervical ganglion of the sympathetic. He finds that this operation brings about an immediate and permanent decrease in intraocular pressure; the pupils become small, the pain ceases, and the vision improves markedly. SULZER.

PANAS (434), referring to Jannesco's paper, states that one must distinguish between the immediate and the late effects of the operation, since the intraocular tension, diminished at first, may increase later and vision fail; as he showed in one case, the tension, which was normal before operation, became increased some time after operation. It is, furthermore, impossible to understand how this operation can be of benefit when the chamber angle is obstructed. Panas believes the number of observations too small and the elapsed time too short to warrant the conclusion that the operation is advisable. V. MITTELSTÄDT.

PANAS (435) recommends the procedure which he had done two hundred times with good results in cases of cicatricial staphyloma and absolute glaucoma in which usually enucleation is done. In narcosis a curved Reverdin needle is entered at the limbus, carried behind the lens, and brought out at the opposite margin of the cornea. The needle is now threaded and later makes the middle suture. The cornea is now excised and the lens removed with a spoon, after which the needle is withdrawn and the suture tied. A suture is now passed on each side of the first, the lateral edges of the wound are trimmed off, and a round stump is obtained by a bloodless operation. The sutures are removed in a week, and a bandage is kept on a week longer. In case of hemorrhage in glaucomatous eyes evisceration is done.

V. MITTELSTÄDT.

CHEATHAM (437) reports two cases in which glaucoma and detachment of the retina were associated. In one the patient was a boy of sixteen years, and the glaucoma preceded the detachment. BURNETT.

XVIII.—SYMPATHETIC OPHTHALMIA.

438. GUMPPER. On the curability of sympathetic irido-cyclitis. *Inaug. Dissert.*, Strassburg, 1898.

439. COPPEZ. Note on a case of sympathetic chorio-retinitis. *Rev. génér. d'opht.*, xvii., p. 298.

440. VACHER. On the relation between incarceration of the iris and sympathetic ophthalmia. *Clin. Ophth.*, 1898, xiv., p. 157.

441. MALL. On sympathetic ophthalmia (preliminary communication). *Centralbl. f. prakt. Augenheilk.*, xxii., p. 245.

442. SHAW, C. E. Sympathetic ophthalmia. *Brit. Med. Journ.*, June, 1898, p. 1580.

443. FERDINAND. Ophthalmitis occurring long after enucleation of the fellow eye for injury. *Ibid.*, p. 1583.

GUMPPER (438) collected sixty cured cases of sympathetic ophthalmia from the literature and adds six new cases, one of which evidently was not sympathetic ophthalmia. Treatment consists in enucleation and the use of mercurials. Resection the author considers of no value, since he has seen no case of true irido-cyclitis cured by neurotomy.

SHAW (442) first gives a very good review of the literature of sympathetic ophthalmia since Deutschmann's well-known experiments. The tendency is to throw considerable doubt on Deutschmann's theory of migration. Shaw examined eight injured eyes, four of which had given rise to sympathetic ophthalmia, without finding any micro-organisms. He also made experiments to determine whether, as Bach maintains, changes will occur in one eye from prolonged irritation of the other. Wounds were made in the ciliary region with septic instruments. Shot pellets were introduced, and jequirity at times used. His conclusion is that though a temporary irritation of one eye may cause a temporary exudation of fibrin and leucocytes both in the irritated eye and its fellow, long-continued irritation will not cause abundant exudation and consequent organic changes in the second eye. WERNER.

FERDINAND (443) records two cases. In the first, some weeks after the injury, the eye was enucleated after some symptoms of mischief in the other; the latter partly recovered, but seventeen years later, having worn a glass eye for three years, irido-cyclitis began again. In the other case the injured eye was removed four days after the injury. Irido-cyclitis set in, in the other eye, twenty-two years later. WERNER.

Sections XIX.–XXII. Reviewed by PROF. R. GREEFF.

XIX.—RETINA.

444. AXENFELD. On albuminuric retinitis in pregnancy. *Corrbl. d. Allg. Mecklenb. Aerztever.*, 1898, No. 199.

445. EWETZKY. On the pathology of albuminuric retinitis. *Wratsch*, 1898, Nos. 32, 33.

446. WILLIAMSON. Unilateral retinal changes in cerebral hemorrhage, embolism, and thrombosis. *Brit. Med. Journ.*, June, 1898, p. 1515.

447. BUCHANAN. Retinal changes in the macular region in cases of injury. *Ophth. Review*, xvii., p. 105.

The prognostic significance of albuminuric retinitis is, as regards life, bad; but the albuminuric retinitis of pregnancy is of less grave significance on account of the transient character of the kidney affection. The visual disturbances are likely to improve, and, according to AXENFELD (444), an expectant plan of treatment may be pursued while V = $\frac{1}{6}$ or better.

EWETZKY (445) examined an eye removed from a patient with albuminuria under the wrong diagnosis of sarcoma of the choroid. In the other eye there was well marked albuminuric retinitis. In the eye that was enucleated there were increased tension and detachment of the retina, and behind the lens but beneath the retina a large black mass which was mistaken for a neoplasm. When examined it was found that there was almost total detachment of the choroid, behind which was a grayish coagulated mass.

The cause of the various changes was traced to inflammatory disturbances in the vessels of the choroid and retina, there being thickening and hyaline degeneration. These vascular changes, with the increased blood pressure from hypertrophy of the left ventricle, are the cause of the extravasations and exudations.

WILLIAMSON (446) records thirteen cases of cerebral vascular lesions, eleven of which were verified by post-mortem, in eight of which retinal hemorrhage or venous dilatation was present, only in the eye on the same side as the lesion. WERNER.

BUCHANAN (447) found, in many injured eyes, that the macular region was raised like a ridge above the general level. The retina here was separated from the pigment layer, and formed primary and secondary folds which were often agglutinated by exudation. Sight may be lost from destruction of the bacillary layer. The pigment in the hexagonal layer is sometimes irregularly distributed. WERNER.

XX.—OPTIC NERVE.

448. DELIUS. On a case of primary tumor of the optic nerve. *Inaug. Dissert.*, Tübingen, 1898.

449. HIGIER. A case of optic neuritis with blindness lasting four weeks, but ending in recovery. *Neurol. Centralbl.*, 1898, No. 9.

450. SIDLER-HUQUEMIN. Optic-nerve atrophy after the use

of pomegranate root, with remarks on the dangerousness of extract of male fern. *Corrbl. f. Schweizer Aerzte*, 1898, No. 17.

451. SILEX. On tabic optic-nerve atrophy with sciopticon demonstrations. *Berl. klin. Wochenschr.*, 1898, No. 39.

452. AXENFELD. Myxo-sarcoma of the optic nerve removed by Krönlein's operation. *Corrbl. d. allg. Mecklenburgischen Aerztevereins*, 1896, No. 195.

453. POSEY. Hereditary optic-nerve atrophy. A report of three cases representing members of three successive generations affected by the disease. *Annals of Ophth.*, July, 1898.

454. HALE, A. B. Tobacco intoxication locally and systemically considered; report of a case of tobacco amblyopia. *Med. News*, Sept. 3, 1898.

According to Braunschweig, up to 1893 there had been reported ninety-four cases of primary tumor of the optic nerve. DELIUS (448) reports a case in a boy of thirteen of healthy family. The tumor had involved the eyeball, and this also was removed. The tumor consisted of cells with large round nuclei and long processes. It filled the entire dural sheath, and had passed through the lamina cribrosa into the interior of the ball.

HIGIER'S (449) patient complained of headache and a sensation of fluttering in the field of the right eye. In the course of the day both eyes became almost completely blind. The patient belonged to a neuropathic family, and smoked and drank moderately. The day before his blindness came on, he had received news of the death of a son. Among other remedies pilocarpine was given by injection, which led to speedy recovery. In the course of two weeks the periphery of the field was restored, while a large central scotoma remained. The case, therefore, was one of typical acute retrobulbar neuritis.

While the text-books on materia medica, toxicology, and internal medicine all speak of the danger of using male fern, still not sufficient warning is given of the intoxications which may follow the use of this anthelmintic and of pomegranate root. SIDLER-HUQUEMIN (450) discusses the various toxic effects of these drugs, which in large doses cause irritation of the central nervous system and gastro-intestinal tract, and finally paralysis and death. In seventy-eight recorded cases of poisoning, permanent blindness in one or both eyes was noted in thirty-three, and amblyopia in five more. With these visual disturbances the pupils are large and

unresponsive, and the ophthalmoscopic picture is that of simple atrophy of the optic nerve, with narrowing of the retinal vessels.

SILEX (451) discusses the differential diagnosis of tabic optic-nerve atrophy and tobacco amblyopia with central scotoma. Under Monk's direction he had experimented on animals in order to discover whether the ordinary weak currents of 2 MA. on the skull and 3-5 MA. on the spine would produce a perceptible effect on the optic nerves, brain, and cord, and found that the galvanization of these parts was possible.

In AXENFELD'S (452) case the exophthalmic eye was directed straight forward and movement was free. The sight was normal three days before the operation, but on the day of operation vision had sunk to 0.8. The osteoplastic operation of Krönlein was successfully performed, the eyeball being preserved. The anterior 3-4 *mm* of the optic nerve was uninvolved, but in the bony canal the nerve was of double its normal size. The preparation showed that the nerve in the middle of the orbit was thickened to three times its proper size, and that the medullated fibres were extensively degenerated. Three and a half months later there had been no return of the growth.

POSEY (453) was able to examine one eye at the beginning of the disease known as hereditary optic-nerve atrophy, in a patient whose other eye had already made some progress in the disease. He found it in a state of slight hyperæmia with blurred outlines to the disk. Central scotoma developed in both, and the final atrophic appearance supervened as usual in such cases. A maternal uncle and a maternal great-uncle were also affected with the same disease and were examined by Posey, finding the condition the same practically as in the first case. All three began to complain of loss of sight at about the same age, twenty-five years. Two were rather heavy smokers, the other was not. BURNETT.

HALE (454) reports that he has seen conjunctivitis in workers in tobacco, due to the irritating quality of the tobacco dust. He reports a case of amblyopia in an excessive smoker who never used alcohol in any form. It was typical in all its features and disappeared on the abandonment of tobacco and under the use of strychnia. BURNETT.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

455. SCHMIDT. On direct injury of the optic nerve from shot wounds of the orbit. *Inaug. Dissert.*, Tübingen, 1898.

456. KELLER. On pulsating exophthalmus. *Inaug. Dissert.*, Zurich, 1898.

457. STOEWER. The histology of the healing processes in wounds of the sclera. *Graefe's Archiv*, xlvi., p. 65.

458. SCHANZ. Luxation of the eyeball from blowing the nose. *Beitr. z. Augenheilk.*, xxiv., p. 33.

459. STÖCKL. Foreign body in the eye. Localization by means of the Roentgen X-rays. *Wiener klin. Wochenschr.*, 1898, No. 7.

460. BERNHARD. A case of filaria loa. *Arch. d'opht.*, xviii., No. 9, p. 604.

461. GRAHAM. Traumatic lesion of the pons Varolii. *Brit. Med. Journ.*, June, 1898, p. 1584.

462. DE SCHWEINITZ. A piece of steel in the vitreous located by means of the Roentgen rays according to Sweet's method; removal of the foreign body with the electro-magnet. *Ophth. Record*, July, 1898.

463. STARR, E. G. Steel in the vitreous located with the X-rays and removed with a magnet, with a description of an arrangement for determining when the magnet has found the steel. *Ophth. Record*, July, 1898.

464. HOTZ. Extraction by electro-magnet of a small chip of steel through the original corneal wound. *Ophth. Record*, July, 1898.

SCHMIDT (455) gives a *résumé* of the literature since 1884 in regard to penetrating shot wounds of the eye, and adds histories of two further cases treated in the Greifswald clinic. In the first the vision was lost, in the second the final vision was $\frac{1}{2}$.

KELLER (456) reports two cases of traumatic pulsating exophthalmus and adds a bibliography for the years 1880–1898, thus bringing up to date the bibliography in the article in *Graefe-Saemisch.*

The 102 cases tabulated are arranged in two groups comprising the traumatic and the idiopathic, and those cases are indicated in which a tumor of the brain or orbit was discovered to be the cause.

A glass-blower, whose eyes had previously been healthy, came to SCHANZ (458) with the statement that, on blowing his nose an hour before, the right eye had been driven out of the orbit, and, a fellow workman having replaced it by force, it again protruded

on his way to the physician. The physician being incredulous, the patient blew his nose and forced the eye out a third time. The lids and surrounding tissues were distended with air. The accident did not happen again, but the vision was reduced to $\frac{1}{3}$ under the picture of a slight optic neuritis.

The explanation is offered that the patient, who frequently had colds, had gotten into the habit of using the same force in blowing his nose as in blowing glass. Thus the accessory cavities had been distended and the bony wall of the orbit affected, until finally a rupture occurred and the air was forced directly into the orbit.

STÖCKL (459) was able with the X-rays to localize a foreign body in the eye in two cases in which other methods had failed even to determine the presence of a foreign body. After a skiagraph had revealed the presence of a foreign body, little lead disks were fastened with plaster at the outer margin of each orbit, in the middle of the upper and lower orbital margins of the injured eye, and on the bridge of the nose. The head was so placed that the shadows of the two disks at the outer margin of the orbits covered each other. Then from the relative position of the shadow from the foreign body and those from the other disks an accurate localization was possible.

BERNHARD (460) reports the removal in Landolt's clinic of a male filaria loa from beneath the skin of the upper lid in a man who had lived two years in the Congo region. The worm moved about readily, now appearing beneath the conjunctiva and now beneath the skin. Besides as lightt witching it caused only a little inflammatory redness without any swelling. v. MITTELSTÄDT.

In GRAHAM's (461) case the pons was injured by a splinter of wood which entered the mouth and perforated the junction of hard and soft palate. There was right hemiplegia and hemianopsia. The case is very carefully recorded and charts of the fields are given. WERNER.

In DE SCHWEINITZ's (462) case the bit of steel was located by the X-rays by Dr. Sweet and in the region of the macula. A triangular flap was made in the sclera below the margin of the external rectus, and a Hirschberg magnet introduced and directed to the point where the foreign body had been located. The bit of steel was withdrawn at the first attempt. It was triangular in shape and 2 *mm* by 3 *mm* large. It weighed 9 milligrams. There was considerable reaction some days later, but under judicious

treatment the eye ultimately recovered with a chalky-looking lens, but good light perception and good projection. BURNETT.

STARR (463) was able by means of the fluoroscope to see the bit of steel moving in the vitreous with each movement of the eyeball. The vitreous was filled with blood. An opening was made in the sclera at the most dependent part and a powerful electro-magnet introduced. A telephone was connected with the magnet, and when the contact of the steel with the magnet occurred it was plainly heard. The bit of steel was removed. No further history of the case is given. BURNETT.

In the case reported by HOTZ (464) the bit of steel had penetrated the cornea, the upper portion of the iris, and lens. It was not visible on account of the lens opacity. He enlarged the corneal wound and introduced the point of an electro-magnet into the lens substance. On the second attempt the chip was removed. It was triangular in shape, 1.5 *mm* at its base. The case did well. BURNETT.

XXII.—OCULAR DISTURBANCES IN GENERAL AFFECTIONS.

465. FÉVÉ and LAUBOY. A note on the variations in the mydriatic effect of atropine in epileptics. *Rec. d' opht.*, 1898, p. 385.

466. GABRIELIDÈS. Tabic hemianopsia. *Arch. d' opht.*, xviii., 5, p. 305.

467. TALKO. An unusual case of phthisis and anophthalmus of the right eye. *Wojenno. Med. Journ.*, May, 1898.

468. SULZER. Contributions to the study of herpes zoster. *Ann. d' ocul.*, cxix., p. 401, and cxx., p. 16.

469. LEITNER. Optic-nerve disease in chronic lead poisoning. *Ungar. med. Presse*, 1898, No. 26.

470. NOYON. On lead poisoning. *Nederl. Oogheelkundige Bydragen*, Aufl. 6, 1898.

471. PERGENS. A contribution to our knowledge of cyanopia. *Ann. d' ocul.*, cxx., p. 114.

472. BOAS. The ocular symptoms of tabes and multiple sclerosis. *Samml. zwangloser Abhandlungen*, Vossius ed., vol. II., part 6.

473. DAWSON and RAMBAUT. Analysis of the ocular phenomena in forty cases of general paralysis of the insane. *Brit. Med. Jour.*, Sept., 1898, p. 687.

474. YARR. Malarial affections of the eye. *Ibid.*, p. 870.

In a tabic patient GABRIELIDÈS (466) found bitemporal hemian-

opsia, which later passed off in part, leaving the middle portion of the temporal field free, while there were still defects above and below. v. MITTELSTÄDT.

TALKO's (467) patient was a soldier aged twenty-two, in whom, without demonstrable cause, the visual field of the right eye became contracted to the nasal side, the ball receded into the orbit, tension diminished, clonic spasms of the orbicularis appeared, and the mobility of the eye became impaired. Finally vision was lost entirely. The patient had attacks of fever, muscular twitching in the right side of the face, and a persistent turning of the head to the right. In spite of careful examination the cause of the symptoms was not discoverable. HIRSCHMANN.

In a monograph on herpes zoster ophthalmicus, SULZER (468) comes to the conclusion that herpes eruptions may be divided into two great classes; it may be due to an acute specific immunizing disease, herpes fever, in which it corresponds to the exanthema of measles or scarlet fever; or it may be merely a symptom of various affections, such as syphilis, tabes, traumatic and infectious bone lesions, phlebitis, gout, sinus inflammation, tumors, vascular diseases, etc.

The greater number of cases seem to fall in the latter category. This is especially the case when the vesicular eruption of the skin and conjunctiva is complicated with symptoms on the part of the eyeball, such as interstitial keratitis, muscular paralyses, and optic neuritis. Such eruptions are not due to an acute infectious disease, but are rather symptomatic of an encephalic affection, circumscribed or diffuse, and mostly basal.

While the prognosis of herpes fever is good, it is uncertain in symptomatic cases, for in these there may come on severe symptoms on the part of the nervous system, or vision may suffer.

SULZER.

NOVON's (470) patient, a lead worker, forty-eight years of age, noticed that, in the course of a severe lead intoxication, the vision of the right eye had become poor. $V = \frac{1}{6}$, contraction of the field temporally and above, no central scotoma. In the vitreous were hemorrhages and dark fixed membranes. The disk was white and swollen, with blurred margins. The lumen of the vessels was very narrow and the walls were thickened. The retina was cloudy and exhibited hemorrhages along the vessels. The picture, therefore, was one of inflammation of the optic nerve passing over into atrophy. The left eye was not affected. WESTHOFF.

Blue-seeing has been reported eight times. PERGENS (471) now records a new case. The patient, a man of forty-four, after drinking heavily one evening awoke in the morning to find that everything appeared blue, and this condition lasted for three days. The eyes were normal in every respect. Red was seen as purple, white appeared to be of corn-flower blue, and blue appeared more saturated than normal. SULZER.

BOAS (472) gives a clear presentation of the ocular symptoms in tabes dorsalis and multiple sclerosis.

The authors (473) give an analysis of the ocular symptoms in forty representative cases of general paralysis in the Richmond Asylum, Dublin. Their conclusions are: that the sensory or sympathetic is the most commonly affected of the pupillary reflexes, then the light reflex, the consensual being rather oftener affected than the direct. Three cases showed advanced atrophy of the disks. There were two cases of neuritis, one only slight. Several cases of third-nerve paralysis were observed mostly in those having a syphilitic history.

[In estimating the pupillary reactions the acuteness of vision was not noted.—L. W.] WERNER.

YARR (474) states that malarial eye lesions all originate in circulatory troubles, and may be classified thus: 1, neuritis; 2, retinal hemorrhages; 3, retino-choroiditis; 4, effusion into the vitreous. In class 1 the chief symptoms are supraorbital pain and photophobia, often night-blindness. Rapid variation in V. Fields intact or slightly contracted. Color = V normal unless atrophy follows. The papilla has a "teinte rouge grisâtre." Partial atrophy occurs in 80 per cent. of these cases. 2. Hemorrhages may be minute peripheral, or large peripapillary and macular. They are often due to infarcts of parasites followed by extravasations. 3. This occurs generally towards the end of the hot stage, and is accompanied by supraorbital pain, photophobia, photopsia, and tenderness on pressing the eyelids. 4. These are rare and are described by Seely (*Trans. Amer. Oph. Soc.*, 1882). The author gives no cases. The following obscure affections have also been mentioned by writers on malaria: Sudden and persistent amaurosis without visible fundus change; periodic amaurosis; sudden amaurosis ending in atrophy; persistent central scotoma; periodical blue vision. Slight degrees of quinine amaurosis are very common in malarial cases under treatment. WERNER.

BOOK REVIEWS AND NOTICES.

(*Continued from page 123.*)

XVIII. **An American Text-Book for Diseases of the Eye, Ear, Nose, and Throat.** Edited by G. E. De Schweinitz and B. Alex. Randall, of Philadelphia. Illustrated with 766 engravings, 59 of them in colors. 1251 octavo pages on glazed paper. Philadelphia, W. B. Saunders, 1899. Price $7 net.

It would not have been necessary, on the part of the editors, to vindicate the propriety of comprising the diseases of the above four organs into one volume, for it is natural, and in America quite common, that one man extend his practice over the four departments, the eye and ear being the organs of the two higher senses, and the nose and larynx those of smell and speech, besides the beginning of the respiratory tract. They are anatomically connected and have physiologically many points of analogy. The physician who has trained himself in the diagnosis of the affections of one of these organs is prepared to master the methods of examination of the others. The four constitute a well rounded field of labor, which is not at all narrow, yet much more restricted than general surgery. How far a man will extend the sphere of his activity must be left to his choice. The more he limits himself to one organ, the less he will split his time and force, the deeper he can penetrate into his subject, the more skill he may acquire in the limited number of his operations, and the more he may advance the science and art of his specialty. On the other hand, he runs the risk of becoming narrow in knowledge and resources, and particularly of failing in the etiology, diagnosis, and prognosis of the diseases he has to treat. The specialist, as well as the general practitioner, must every day devote a part of his time and labor to preserve his general knowledge and follow the advance of science.

Another feature of the text-book under consideration the editors think it unnecessary to discuss is the "collaboration method," which certainly has its advantages, but no less its dangers. That in the volume before us the dangers have been more avoided than in any other collective literary enterprise we are familiar with, is the merit of the editors for which they deserve the greatest credit. The 618 pages of the ophthalmological part have been written by 30 authors, and yet we must confess there is a remarkable homogeneity and a fair observance of the *suum cuique* in the collective work.

As for the character of the work—we now deal only with the ophthalmological part—we take pleasure in declaring it of a high order throughout. It is not a book for the student or practitioner of general medicine, but for the advanced student and practitioner in ophthalmology, and we desire to make a distinction between ophthalmology and ophthalmic surgery, the latter being only a part of the former.

The **scientific part** of the text-book, the first 141 pages, is particularly to be commended. The embryology, anatomy, and histology of the eye, by GEO. A. PIERSOL, of Philadelphia, comprises 61 profusely illustrated pages, and gives a very good, condensed description of the part, brought up to date.

In the general physiology of the eye Dr. A. P. BRUBAKER considers the eye as a living camera, in a conventional manner—14 pages. The chapter on general optical principles—katoptrics, dioptrics, physiological optics—by W. S. DENNETT and C. W. CUTLER of New York, 40 pages, is of fundamental importance and strictly scientific, requiring an extensive mathematical apparatus which, we are afraid, will shoot over 90 % of the living ophthalmic surgeons both in Europe and America. I don't want to say that it is beyond the horizon of a well-educated student, for it is only a fraction of Helmholtz's *Physiological Optics*. In the progress of radical teachings such studies will soon be more generally pursued and required than they are at present.

We have to content ourselves to mention the other chapters by title.

General examination of the patient, and functional testing, by G. E. De Schweinitz; Ophthalmoscopy, B. A. Randall; Refraction, E. Jackson; Spectacles, R. J. Phillips; Diseases of the Eyelids, B. L. Millikin; Lachrymal Apparatus, Sam. Theobald; Conjunctiva, J. E. Weeks; Cornea and Sclera, S. M. Burnett;

Ciliary Body and Sympathetic Ophthalmia, R. L. Randolph; Injuries, A. A. Hubbell; Glaucoma, J. A. Lippincott; Lens, W. E. Hopkins: Vitreous, Fl. Carrow; Retina, L. Howe; Optic Nerve, H. Gifford; Defects of Vision, C. A. Wood; Visual Field, H. V. Würdemann; Intraocular Growths, W. A. Holden; Motility, A. Duane; Orbit, F. Buller.

The **Operations** are distributed as follows:

Preparations, etc., Anæsthesia, G. E. De Schweinitz; Eyelids, F. C. Hotz; Conjunctiva, Cornea, Sclera, Globe, C. W. Kollock; Iris and Lens, H. Knapp; Muscles, S. C. Ayres; Lachrymal Apparatus, S. Theobald; Orbit, F. Buller. In an appendix are treated of: Color Blindness in R. R. Employés, J. E. Jennings and A. G. Thompson; Röntgen Rays, W. M. Sweet; Practice of Operations on Animals' Eyes, C. A. Veasey; Micro-organisms in Eye Diseases, G. E. De Schweinitz.

We have perused the book with great interest, and though here and there we differ with some of the authors, we can say that the presentation of all the subjects is good, none treated at undue length, some rather laconically, but nothing essential seems to have been omitted. The typography and proof-reading are very good. Our opinion is that every American eye surgeon will be gratified in adding this text-book to his library. H. K.

XIX. **A Practical Handbook of the Muscular Anomalies of the Eye.** By HOWARD F. HANSELL and WENDEL REBER. 182 small-octavo pages, 28 illustrations, and 1 plate. Philadelphia: P. Blackiston, Son, & Co., 1899. $1.50.

This neatly gotten-up little book contains in very plain and easily intelligible style all that has thus far come to light on the disturbances of motility and their treatment. Abstruse deduction and specious argumentation are avoided. It is a complete and well-arranged guide-book for the study of a large group of eye-diseases which present themselves to the ophthalmic practitioner more and more every year, and to which particular attention has been paid in America. H. K.

XX. **A Treatise on Unripe Cataract.** By WM. A. M'KEOWN, of Belfast. Large-octavo volume of 202 pages, with 60 original drawings. H. K. Lewis, 136 Gower Street, London, 1898.

Dr. M'Keown's treatise is a most valuable contribution to the treatment of cataract and will be read and studied with interest and profit by every, even the most experienced, ophthalmic

surgeon. Its principal object is to describe, in minute detail and based on personal experience, how to remove unripe cataracts by a method "of very general application, involving no very great difficulty for the surgeon, and no special risk for the patient, with a precise statement of the rules for its application, and detailed reports of an adequate number of illustrative, non-selected cases." This is a great practical question the solution of which has been tried in many ways. M'Keown's method is to inject a liquid into the capsular sac "by a fine hollow needle immediately before the capsulotomy, after section at the corneo-scleral junction with iridectomy" (p. 54). "If the cortex is soft, the needle readily enters, without danger of dislocating the lens. It renders transparent substance opaque, breaks up striated, flaky, mother-of-pearl cortex, separates cortical substance from the lens, and may, if the surgeon uses the method freely, wash out more or less" (p. 55). The difficulties encountered in the introduction of the needle are considered by M'Keown to be of great diagnostic and prognostic value :

1. "In nuclear cataract, the needle, instead of entering the lens, may push it before it." The surgeon then must desist lest he rupture the zonule of Zinn. Such lenses are sclerosed and will come out *en masse*.

2. "When in nuclear cataract the needle enters readily, the cortex is relatively soft, and may remain after expulsion of the nucleus. Here, after injection, the superficial cortex becomes opaque, generally at once, but there should be no hurry in removing the lens."

3. In cortical cataract the injection makes the lens swell, . . . and "in case of a small nucleus the latter might sink down and lead artificially to the same condition and the same troubles as are met with in Morgagnian cataract" (p. 60) [which troubles the reviewer has never found great].

The author discusses the efficacy of massage, irrigation, and scooping, each of them used alone, or in combination with intracapsular injection or with either or both of the others.

Quite interesting is the tabular arrangement of the probable behavior of the various forms of cataract during the operation, and what can be expected from the different procedures when applied to these forms. The reviewer would agree with most, but not all, of the author's statements and propositions, but for lack of space he has to forego arguing his points.

The author devotes a good deal of space—in text-book manner and without imparting much novel or suggestive information—to the preparation for cataract operations in general, asepticism, instruments, light, and optical aids. Then follows (in chapter vi.) a detailed description of the apparatus, method, and liquid used for injection and irrigation. The liquid is a warm, physiological saline solution, sterilized, in a flat-bottomed Florence flask, arranged as a syphon by a glass tube dipping into the liquid inside and provided with a rubber tube outside to which is attached the hollow needle whose tip is introduced into the lens capsule. The liquid is forced out by air pressed into the flask by an elastic ball through a second, shorter glass tube, in the well-known manner. The description is illustrated by plates.

Now follows a description of the usual operation for cataract from which we learn that the author, after trials with simple extraction, that have proved unsatisfactory, has returned, as a rule, to the combined method. The accidents during the operation, the post-operative incidents, and the after-treatment conclude the general part of the book, 125 pages. The table of 155 case records, mentioned above, gives in the first 55 cases the ordinary forms of incomplete cortical cataract in patients up to sixty years of age, 34 of the same kind in patients above sixty, and 26 of uncommon forms of cortical cataract. Then follow 37 cases of incomplete nuclear, and 3 cases of complicated cataract.

Intracapsular injection was made in 55 cases; attempted but desisted from in 6. The great field for intracapsular injection is in cortical cataract.

Irrigation in various ways was performed in 146 cases, in 123 clearing the pupil perfectly, in 23 partially. Results good.

As post-operative incidents the author noted:

Case 57. Prolapse of iris in a case of simple extraction, treated with electro-cautery. S $\frac{1}{\infty}$.—Case 62. Irido-cyclitis, following incomplete removal of cortex because of high tension.—Case 71. Sepsis.—Case 110. Late irido-choroiditis; cause unknown.—Case 141. Nervous shock.

In conclusion the reviewer begs to say that intracapsular injection as presented by the author appears to have been followed by good results and have been free from notable danger. It introduces a new stage into the extraction of cataract that requires a relatively cumbersome apparatus and the excision of a piece of iris. Whether these disadvantages are outweighed by

its intrinsic value cannot be determined by the reviewer of the treatise, however favorably he may be impressed, but only by the personal experience of many competent surgeons. H. K.

XXI. **Researches anatomiques et cliniques sur le glaucome et les neoplasmes intraoculaires.** By Prof. PANAS and Dr. ROCHON DUVIGNEAUD. With 41 figures in the text. Paris: Masson & Co., 1898. 7 frs.

The article **Glaucoma** treats in twelve chapters, 240 pages, of this remarkable disease in all its aspects. The first six chapters contain the normal and pathological anatomy and the physiology of the parts concerned in glaucoma, illustrated by numerous and well-executed illustrations. Chapters viii. and ix. give a *résumé* of the authors' clinical observations and the pathological anatomy of the available cases; chapter x., a critical discussion of the glaucoma theories.

The description of the tumors of the choroid (sarcomas) occupies 110, and that of the retinal tumors 65 pages. Remarks on pseudo-tumors (42 pages) conclude the nicely gotten-up volume. We cannot say that we find in the monograph a great deal that is new, but the literature on the subject, especially the German, is carefully cited and discussed. Any one who wants to inform himself on the different questions of glaucoma up to date could not find for his purpose a more interesting and more authoritative book.

H. K.

XXII. **Glaucoma; its Symptoms, Varieties, Pathology, and Treatment.** By ALEX. W. STIRLING, M.D. St. Louis: Parker, 1898. $1.50.

This monograph of 177 large-octavo pages, with some microphotographs, is a concise and clear exposition of the clinical and pathological features of glaucoma. It is based on lectures given by the author in the Post-Graduate School and Hospital, New York. They were published serially in the ANNALS OF OPHTHALMOLOGY, and many oculists will thank the publisher for putting the very valuable treatise in a convenient form at their disposal. H. K.

XXIII. **Communications from the Eye Clinique of the Carolinian Med.-Chir. Institute of Stockholm** (in German). By Prof. J. WIDMARK. First number, with a plate and 4 text figures. Jena: G. Fischer, 1898.

This publication—251 large-octavo pages, well printed on good paper—is the first number of a German edition of papers which have

appeared in the Swedish language, of which others will follow at irregular intervals. The present number contains seven articles :

1. On the position of the papillo-macular bundle.
2. Statistical investigations on myopia.
3. On the violet end of the spectrum.
4. Experimental investigations on the disinfection of the conjunctiva, by Albin Dalén.
5. On the mechanical and medicinal treatment of trachoma, by U. Hellgren.
6. The operative treatment of unripe and stationary partial cataracts, by J. Widmark.

All these papers are of great practical value, and readers of German will be very grateful to Professor Widmark for having put these contributions at their disposal. H. K.

MISCELLANEOUS NOTES.

SOCIETY MEETINGS AND ELECTIONS

The **Western Ophthalmological and Oto-Laryngological Association** at its annual meeting, 10th and 11th February, 1899, at New Orleans, elected Dr. W. Scheppegrell, of New Orleans, president, Drs. M. A. Goldstein, of St. Louis, and H. V. Würdemann, of Milwaukee, Vice-Presidents, and Dr. F. C. Ewing, of St. Louis, Secretary.

Société française d'ophtalmologie. The 17th annual meeting will be held at the Hôtel des sociétés savantes, opposite L'école de médecine, Paris, May 1st. Subject for general discussion will be: "La suppression du crystallin transparent," introduced by Professor Pflüger, of Bern.

APPOINTMENTS.

Privatdocent ÖLLER, of Munich, and Privatdocent BAAS, of Freiburg i. B., have been appointed Extraordinary Professors.

Dr. HERMAN SNELLEN, Jr., has been appointed Associate Professor of Ophthalmology at Utrecht, Holland.

Dr. C. A. WOOD has been appointed Professor of Ophthalmology at the College of Physicians in Chicago.

Dr. TSCHERNING has been made Chevalier de la Légion d'honneur.

Obituary.

Dr. JULIUS SAMELSOHN, of Cologne, died March 7, 1899, in his fifty-eighth year. He was a pupil of v. Graefe, eminently talented, very industrious, enterprising, and scientifically extraordinarily productive. He settled at Cologne in 1867; founded the Cologne Charitable Eye Hospital. Among his numerous publications we

mention particularly one which is of paramount importance and will secure for him a permanent place not only in the history of ophthalmology but also in that of general medicine, viz. : "On the Anatomy and Nosology of Retrobulbar Neuritis" (*Arch. f. Ophthal.*, xxxviii., 1, 1882). It describes the author's discovery of the atrophy of the papillo-macular bundle in toxic amblyopia and other diseases.

Dr. JUNGE, Professor of Ophthalmology in St. Petersburg, a pupil of v. Graefe and Helmholtz, died last year. He published valuable contributions to ophthalmological literature, and was for a time the most prominent ocular surgeon in St. Petersburg.

Dr. CLIFTON S. GRAY, a well-known and accomplished oculist and aurist, died February 14, 1899, at Little Rock, Ark. He was forty-nine years old, and a native of Missouri.

JOURNAL NEWS.

Dr. H. V. WÜRDEMANN, of Milwaukee, who has been associate editor of the *Annals of Ophthalmology*, in charge of the German literature, has accepted the position of editor-in-chief, instead of Dr. Casey A. Wood, of Chicago, resigned. Dr. Wood will retain an interest in the *Annals*, and will remain in charge of the Italian ophthalmological literature.

Since January of 1899 a new monthly German journal of ophthalmology, under the title of *Zeitschrift für Augenheilkunde*, has been published by S. Karger, in Berlin, at the annual price of Mk. 30. It is edited by Profs. H. KUHNT, of Königsberg, and J. MICHEL, of Würzburg, assisted by a corps of well-known collaborators : Cirincione, V. Ewetzki, V. Grosz, Gruber, Kauwcki, Koster, Widmark, Bach, Czermak, Haab, Mellinger, Pagenstecher, Peters, Raehlmann, Schmidt-Rimpler, Silex, Uhthoff, Vossius, and Wilbrand. The journal will publish original articles on all ophthalmological subjects, reports of societies, and half-yearly reports on the progress of ophthalmology in all countries. The ophthalmological literary production of Germany is so extensive and valuable that new and earnest enterprises are sure to be well supported, both by contributors and subscribers. We doubt, however, that the half-yearly reports are needed to fill a want, for Germany is well supplied with monthly, quarterly, and annual reports. Yet competition will here, as in most enterprises, serve a good purpose ; it will stimulate the older journals

to introduce, among other improvements, a prompter appearance of their reports.

A new ophthalmological journal in Spanish has appeared in monthly numbers of 24 or 32 pages in Mexico, at the annual price of $2. It is edited by Drs. M. U. TRONCOSO and D. M. VÉLEZ, of Mexico, J. SANTOS FERNÁNDEZ, of Havana, and CHAS. A. OLIVER, of Philadelphia, under the title of *Annales de Oftalmologia*. A long list of foreign collaborators will give their support to this periodical, which in its country is certainly opportune. Its chief contents consist in abstracts from literature.

Contents of the last numbers of the Archiv für Augenheilkunde (German Edition of these ARCHIVES).

Vol. XXXVIII., No. 2. Issued December, 1898.

9. L. LAQUEUR (Strassburg). Movements of the pupil.
10. PURTSCHER (Klagenfurt). Traumatic enophthalmus.
11. SEYDEL (Breslau). Aneurysma arterio-venosum retinæ.
12. C. PEIRONE (Turin). Expulsive hemorrhage in cataract extraction.
13. K. KIRIBUCHI (Tokio). The dilatator muscle of the pupil.
14. G. ABELSDORFF (Berlin). Translation of the original articles of the English Edition of these ARCHIVES (ARCH. OF OPHTH., vol. xxvi., No. 4; vol. xxvii., Nos. 1, 2, 3).

Systematic Report of the Progress of Ophthalmology in the 2d quarter of 1898 (translated).

No. 3. Issued February, 1899.

15. HABERKAMP (Bochum). Bilateral blindness from a shot with a Tesching rifle.
16. M. REIMAR (Hirschberg). Hemorrhagic retinitis from endarteritis proliferans.
17. H. LEWIN (Berlin). Abnormal tortuosity of retinal vessels.
18. G. LEVINSOHN (Berlin). Choroidal sclerosis with secondary degeneration of the retina.
19. G. ABELSDORFF (Berlin). The original articles in the ARCH. OF OPHTH., vol. xxvii., No. 4 (Kibbe, H. Knapp, Sweet, Lippincott).

Systematic Report, 3d quarter, 1898 (translated).

No. 4. Issued March, 1899.

20. L. HEINE (Marburg). Anatomy of the myopic eye.

21. M. REIMAR (Hirschberg). The so-called embolism of the central artery of the retina and its branches.

22. C. RITTER (Bremervörde). Embryology of the frog's lens.

23. K. JARNATOWSKI. Iridocyclitis from choroidal sarcoma.

24. G. ABELSDORFF. The original articles in ARCH. OF OPHTH., vol. xxvii., No. 5 (Zimmermann, Dunn, Holden).

Systematic Report, 4th quarter of 1898. Translation in our next issue (May number).

Erratum.—The price of *Ramsay's Atlas of External Diseases of the Eye*, in the book notices of the January number, page 120 of this volume, is erroneously put down as $16, whereas it should be $20.—ED.

CONTENTS OF VOLUME XXVIII., NUMBER 3.

PAGE

1. A Case of Paralysis of Divergence: its Bearing upon the Theory of Squint and Heterophoria. By Dr. **Alexander Duane,** New York. (With a text figure) 261

2. A Further Contribution to the Extraction of Particles of Steel or Iron with Haab's Large Electro-Magnet. By **A. Barkan,** M.D., San Francisco 282

3. Bullet Wound through Head with Loss of Right Eye and Vision Much Impaired in Left. By Dr. **J. H. Delany,** Erie, Pa. . 289

4. The Use of the Extract of the Suprarenal Capsule in Diseases of the Eye. By **W. H. Bates,** M.D., New York 293

5. Concerning the Bacteriology of Acute Catarrhal Conjunctivitis. By **C. A. Veasey,** A.M., M.D., Philadelphia 301

6. On the Injection of a Weak Sterile Salt Solution into Collapsed Eyes. By **Herman Knapp** 308

7. Note on the Use of Euphthalmin. By **Herman Knapp** . . . 313

8. Note on the Use of Holocain. By **Herman Knapp** 315

9. The Nerves of the Human Lid. By Dr. **Ludwig Bach.** Translated by Dr. MATTHIAS LANCKTON FOSTER, New York. (With Plates XII. and XIII. of Vol. XXXIII. of German Edition) . 317

10. The Corneal and Scleral Nerves as Shown by Golgi-Cajal's Osmium Bichromate Silver Method. By Dr. **Ludwig Bach.** Translated by Dr. MATTHIAS LANCKTON FOSTER, New York. (With three Illustrations on Plates XIV. and XV. of Vol. XXXIII. of German Edition) 320

11. Description of a Portable Electro-Magnet, an Original Device, to be Used in Connection with any Incandescent Electric-Light Current, for Removal of Pieces of Steel from the Interior of the Eyeball. By Dr. **Walter B. Johnson,** Paterson, N. J. (With four figures in the text) 326

12. Report of the Section of Ophthalmology and Otology of the New York Academy of Medicine. By Dr. **J. Herbert Claiborne,** Secretary 330

PAGE

13. Systematic Report on the Progress of Ophthalmology in the Fourth Quarter of the Year 1898. By. Dr. **St. Bernheimer,** in Vienna; Dr. **O. Brecht,** Prof. **R. Greeff,** Prof. **C. Horstmann** and Prof. **P. Silex,** in Berlin; with the assistance of Dr. G. Abelsdorff, Berlin; Dr. S. M. Burnett, Washington; Dr. Dalén, Stockholm; Dr. Herrnheiser, Prague; Prof. Hirschmann, Charkow; Dr. Krahnstöver, Rome; Dr. P. von Mittelstädt, Metz; Prof. Da Gama Pinto, Lisbon; Dr. Richard Schweigger, Berlin; Dr. Sulzer, Paris; Dr. L. Werner, Dublin; Dr. C. H. A. Westhoff, Amsterdam; and others. Translated by Dr. WARD A. HOLDEN, 335

A.—Prof. C. HORSTMANN. General ophthalmological literature, 335; General pathology, diagnosis, and therapeutics, 338; Instruments and remedies, 340.

B.—Dr. ST. BERNHEIMER. Anatomy, 342; Physiology, 342; Anomalies of refraction and accommodation, 344; Muscles and nerves, 345.

C.—Prof. P. SILEX. Lids, 347; Lachrymal affections, 348; Orbit and neighboring cavities, 349; Conjunctiva, 351; Cornea, sclera, and anterior chamber, 355.

D.—Dr. O. Brecht. Lens, 357; Iris, 358; Choroid, 359; Vitreous, 360; Glaucoma, 360; Sympathetic ophthalmia, 362.

E.—Prof. R. GREEFF. Retina and functional disturbances, 362; Optic nerve, 366; Injuries, foreign bodies (parasites), 367; Ocular disturbances in general diseases, 368.

14. Notices and Reviews of Books 372

XXIV.—Defective Eyesight. By D. B. St. John Roosa.

XXV.—Leçons de Clinique Ophtalmologique. By Prof. Ph. Panas.

XXVI.—A Text-Book of Ophthalmology. By Prof. Ernest Fuchs.

15. Note of Correction 377